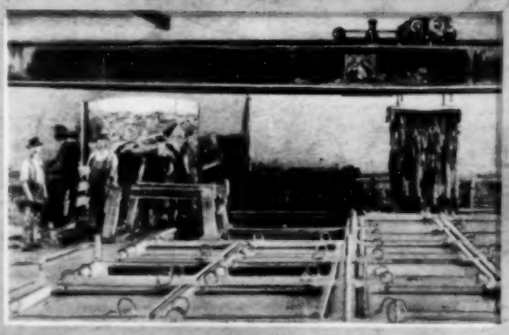
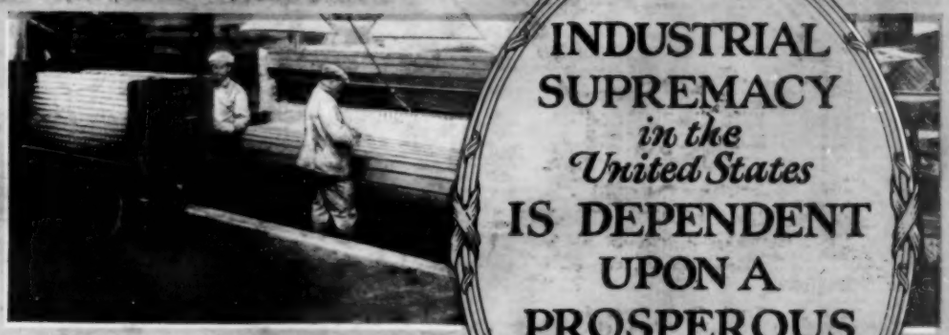
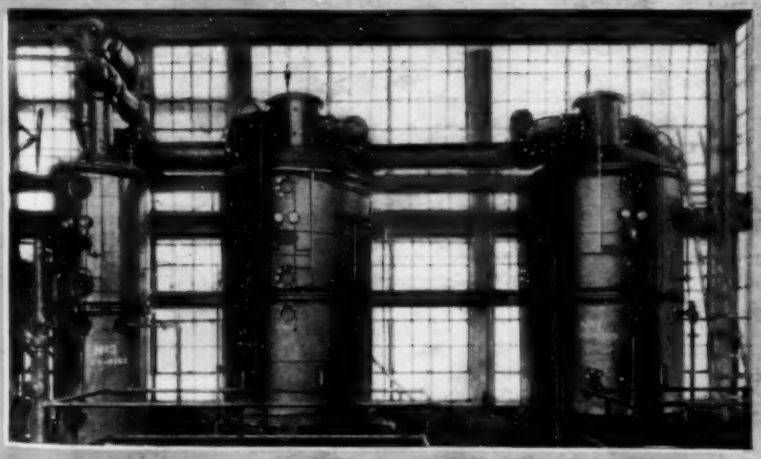
SECOND ANNUAL REVIEW NUMBER January 19, 1925

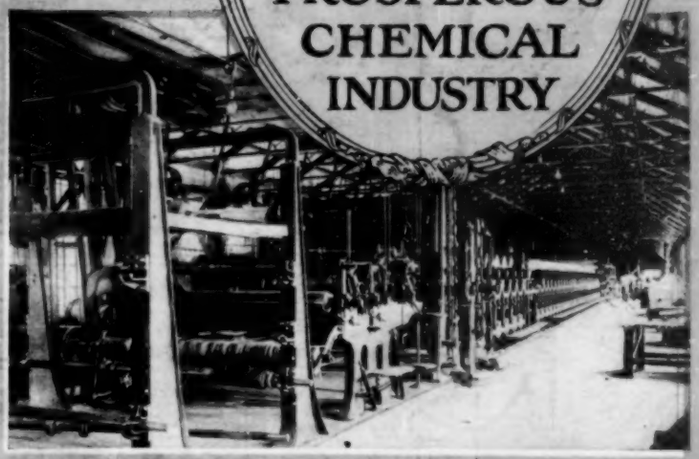
CHEMICAL & METALLURGICAL ENGINEERING

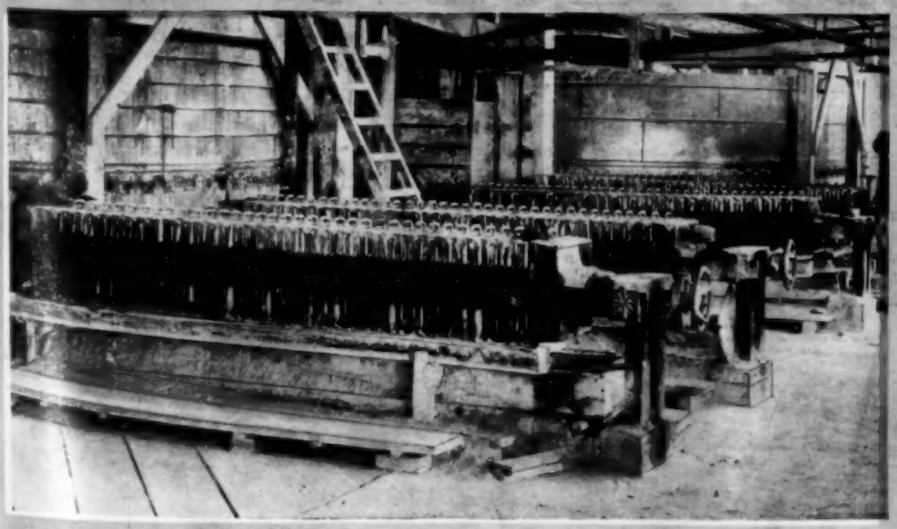


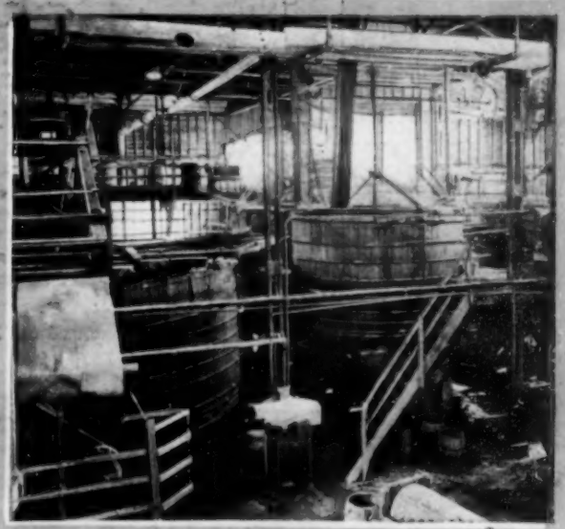


INDUSTRIAL SUPREMACY *in the United States* IS DEPENDENT UPON A PROSPEROUS CHEMICAL INDUSTRY









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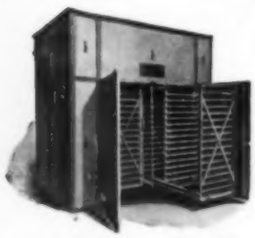

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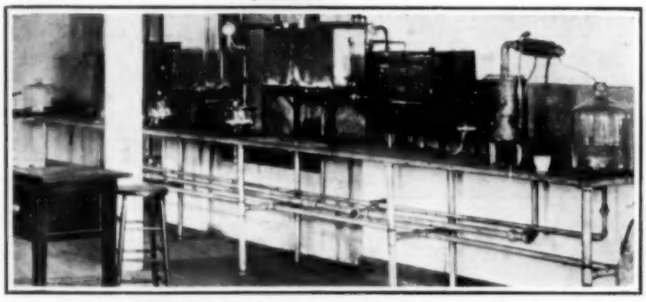

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CHEMICAL & METALLURGICAL ENGINEERING

H. C. PARMELEE
Editor

Volume 32 | New York, January 19, 1925 | Number 3

Reviving a Neglected Factor in Business Success

BY DINT of constant preaching and much repetition, American industry is becoming impressed with the fact that the quantitative control of marketing and distribution is an important but neglected factor of success in industry. The idea has taken hold slowly. For example, 3 years after Secretary Hoover officially directed national thought into this channel, the first conference on distribution was held in Washington last week.

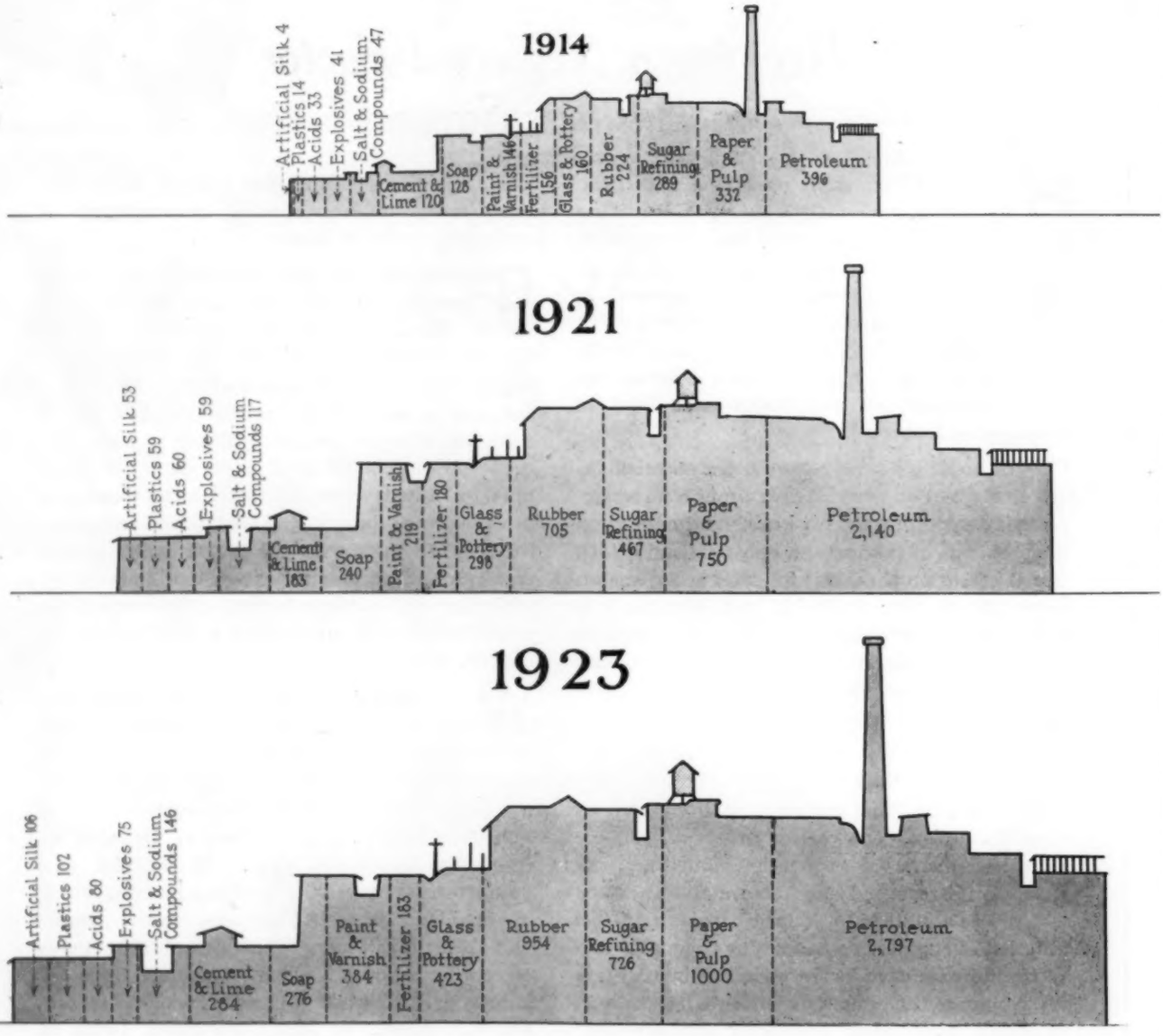
THE topic is a timely one for the chemical industry. For what shall it profit a manufacturer if he concentrate his brains and capital on the problems of production, only to dismiss with casual attention the plans for sales and distribution? Waste here is doubly lost, because it is incurred after the value of manufacture has been added to raw material. Reprehensible in any business, it is particularly flagrant in the chemical engineering industries, where scientific and engineering methods are supposed to rule.

ENGINEERING methods do prevail quite generally in planning and executing research, design, construction and operation—in all the elements of production—but they are painfully disregarded and thrown to the winds when sales and distribution are considered. The function of engineering, according to an able and successful executive in the chemical industry, is to "eliminate the casual" in business, whether in financing, purchasing, producing or marketing; to apply to all these elements of business the known and ascertainable facts of natural science, engineering and economics. And yet prices are fixed without accurate cost data; purchases are made without specification and a full knowledge of the market; and production is ordered without adequate analysis of the sales possibilities, consumption and stocks. In short, the casual is not eliminated and business depression, if not failure, results. The financial statement shows a loss instead of a profit. And a profit, in the last analysis, is the necessary concomitant of successful business endeavor.

CONSIDERING the favorable outlook for business this year, *Chem. & Met.* hopes to see a prosperous chemical industry in the United States; an industry in which sound engineering principles and methods are applied not only to research and production, but also to sales and distribution; an industry in which the casual is eliminated from every factor of business; an industry free from foolish and disastrous price cutting; an industry with profit enough to make a fair return on the investment, support research and provide for expansion; an industry with financial statements that will command the respect of bankers and make them willing to loan money, if desired.

AS a modest contribution to that end *Chem. & Met.* offers its Second Annual Review Number. It charts the economic trend and technical progress of the chemical engineering industries in 1924, and focuses the views of industrial leaders and members of the staff on the activities of the year. It contains new quantitative data, not only on production, prices, imports and exports, but also those equally valuable, though more difficult to obtain, figures on consumption of chemical commodities by industries. The whole is enriched with charts and graphs. *Chem. & Met.'s* Weighted Index of Chemical Prices has been recalculated on the basis of latest available census figures and a separate price index for Oils and Fats has been constructed in order to follow more accurately conditions in these industries. On the whole, we believe the industry will find in this issue definite help in eliminating the casual from business, an aid in putting distribution on the same scientific basis that has come to characterize chemical engineering production.

TEN YEARS GROWTH
in the principal
CHEMICAL ENGINEERING INDUSTRIES
in the
UNITED STATES



Areas represent value of products
in
Millions of Dollars

Alkali as a Business Barometer

Diversified Consumption Accurately Reflects Industrial Conditions

By E. M. Allen

President, The Mathieson Alkali Works, Inc., New York City

THE manufacture of alkali in this country is among the largest and most important branches of the heavy chemical industry, and its business trend is now recognized as an accurate barometer of business, due to the large and diversified channels in which are consumed caustic soda, soda ash, bicarbonate of soda and chlorine.

A review of this industry must be considered from two positions, since alkali is produced by the ammonia-soda process and by the electrolytic process. There are five manufacturers producing alkali by the ammonia-soda process, while there are more than seventy installations for the production of electrolytic alkali, although many of these latter installations were erected during the war and are now idle. Virtually all of the electrolytic alkali now produced for commercial purposes is manufactured by ten or eleven companies, operating large plants.

The ammonia-soda group has a producing capacity of approximately 2,400,000 tons per year in terms of 58 per cent soda ash, and 50,000 tons of natural soda, but as there is a large tonnage of this ash manufactured into caustic soda, the ammonia-soda group has an annual producing capacity of about 400,000 tons of 76 per cent caustic soda. A conservative estimate of the plant capacity of the electrolytic plants that are now being operated would show a capacity of approximately 250,000 tons of 76 per cent caustic soda. The Bureau of the Census reported for 1923 the sale of 1,258,780 tons of soda ash and 430,961 tons of caustic soda; the latter divided between ammonia-soda caustic (311,838 tons) and electrolytic caustic (119,123 tons).

Actual production, as contrasted with production for sale, was naturally somewhat higher than these figures. The Census reports, for example, that there was produced in 1923 by the ammonia-soda process 314,195 tons of caustic soda and by the electrolytic process 122,424 tons. The actual output of soda ash, as given in the same report, was 1,707,987 tons, of which 449,207 tons was consumed in the plants where it was made.

Very few industries require such an enormous amount of invested capital per ton of output as does a works producing alkali by the ammonia-soda process. Furthermore, in the writer's experience, he has never seen such small returns on invested capital as is shown in operating an ammonia-soda works. This undoubtedly accounts for the small number of companies engaged in this industry. The only way that reasonable returns are obtainable in this line is by the sale of large tonnages, as the margin of profit per ton of output is extremely small. If a justified and proper depreciation and obsolescence were charged, prices could not help but be materially advanced over those now prevailing. Records show that every 15 years an ammonia-soda plant has to be virtually rebuilt, and also a good strong surplus must be built up to fortify against the discovery of cheaper processes that might revolutionize the alkali field. In this connection no industry has this menace so continually hanging over it more than has the chemical industry, and a very heavy obsolescence charge should be made, in all chemical lines, to take care of such situations if and when they do come.

During 1924 the ammonia-soda alkali plants were able to operate at only 70 to 75 per cent of their capacity, but they should be able to advance to 90 per cent operating capacity during the first half of 1925, and perhaps hold same throughout the whole year. As the 1924 prices are being quoted for 1925 contracts, any increased profits this year can come only from increased production, with the slight decrease in costs on account of same.

Of the chlorine capacity of plants now being operated, only about 52,500 tons per year can be liquefied with present liquefaction installations. The remaining chlorine could produce bleaching powder to the extent of approximately 150,000 tons per year, although bleaching powder capacity is being rapidly dismantled as the product is being replaced by liquid chlorine. It is safe to say that in 85 to 90 per cent of the uses for bleaching powder this product can be replaced by liquid chlorine and show a material saving.

Taken as a whole, the 1925 outlook for the alkali industry looks only fair, due entirely to expected increased tonnage that must accompany the general revival of business. On account of 1925 contracts being written at last year's prices, the only additional profits that can be expected are those secured by increased operations, coupled with an increase in exports. All exports are handled through the U. S. Alkali Export Association, whose activities are being copied by many lines of industry in this country which have their eyes on the world's markets.

Bright Future for Sulphur Industry

Consumption Increasing as General Business Throughout the Country Expands

By Raymond F. Bacon

Consulting Engineer, Texas Gulf Sulphur Co., New York City

THE world situation during 1924 in the sulphur industry did not differ materially from that of the previous year. Again three companies in the United States produced and sold the bulk of the world's consumption. These three companies are the Texas Gulf Sulphur Co., the Union Sulphur Co. and the Freeport Sulphur Co. In addition to the United States, Italy produced during the year perhaps 250,000 tons, and Japan probably about 30,000 tons, the latter supplying its own market. The world's market outside of North America was stabilized through an agreement between the Italian Government and the Sulphur Export Corporation, comprising the three American companies. This agreement allocates to the Italian industry the sale of 200,000 tons of sulphur. The total world's consumption during the past year was about 1,750,000 tons and the production of the United States was about 1,300,000. Stocks on hand, which at the end of 1923 were reported to be 2,900,000 tons, probably decreased during the year to the extent of 300,000 to 400,000 tons.

The distribution of sulphur in the several consuming industries is about as follows: Fertilizer 30 per cent, acid and chemicals 34 per cent, paper and pulp 24 per cent, explosives 5 per cent, and miscellaneous industries 7 per cent. It is perhaps worth while to review the situation in these various fields before turning to the present outlook.

The sulphuric acid industry is the largest consumer of sulphur in this country, and the fertilizer industry uses more than half of the sulphuric acid produced from brimstone. The latter industry was badly disorganized by unprofitable competition in the early months of 1924, and the failure of one of the largest manufacturing companies had a profound effect. At the end of the season fertilizer manufacturers saw the necessity of moving with caution on another year's work and many plants closed during summer months. The first of September saw a revival of manufacturing activities and all companies appear to be looking forward with more confidence. The fertilizer industry as a whole fell off in operations between 10 and 15 per cent as compared with 1923, but the outlook for the coming year is quite bright.

The chemical industry, in spite of disastrous competition on sulphuric acid and heavy chemicals in general, operated at about same rate as in 1923. The closing of some steel mills in the Middle West during the summer months reduced the demand for sulphuric acid for pickling as well as for ammonium sulphate product at the byproduct ovens. In some instances zinc smelters increased the use of sulphur in order to fill their sulphuric acid requirements as roasting of ores fluctuated.

The explosives industry improved during the closing months of the year so that the decrease from 1923 was slight.

The paper pulp industry, while feeling foreign competition keenly, continued operations at practically the 1923 rate; in some instances this was due to stocking of warehouses with pulp ready for paper manufacture when demand and prices justified. Many new sulphite pulp projects are rumored on the Pacific coast and in Canada. With a steady growth of demand for pulp and paper products, manufacture of the two must increase and the only possible point for expansion is in Canada, where the increase will be reflected in increased export sales.

Discussion has been current on a new sodium sulphate process and if this develops there will be a greater demand for sodium sulphate in the pulp industry. At the present time most of the sodium sulphate is made from salt and sulphuric acid as a byproduct of hydrochloric acid production. However, it is said that the natural deposits of the Pacific coast and Canada may become serious competitors of the manufactured article within the limits of freight differentials.

Production of lime sulphur and of sulphur for dusting was seriously affected by conditions in the fruit-growing districts. The Pacific coast suffered from low prices for products in the fall of 1923, and this, combined with the drought, placed the farmers in a bad position for buying insecticides and sprays.

Grinders and refiners have felt the decrease in operations of rubber and tire manufacturers, which have been as much as 10 to 15 per cent less than in the preceding year.

The sulphur business as a whole will perhaps show a slight decrease in 1924 as compared with 1923. With general business expanding, however, the future looks bright for this industry.

A Live Slogan for Lime Industry

"Better Lime for the Consumer" Produced by Sound Research and Improved Technology

By George B. Wood

President, National Lime Association, Rockland, Me.

THE tonnage of lime shipped during the past year for miscellaneous chemical uses probably will show a decrease over 1923 tonnage when full statistics are tabulated. Many of the industrial chemical processes that require lime as a raw material, such as the paper industry, the leather industry and some departments of iron and steel manufacture, did not run to full capacity during a portion of the year, due to general business depression. Most of these industries, however, have again resumed operations on a larger basis, and it is to be expected that the year 1925 will be a full year of good business prosperity, with a demand for lime in chemical uses equal to if not greater than that of the year 1923.

Within the last half-dozen years the lime industry has advanced in growing knowledge of its product and its product's uses to a greater extent than at any time in its past history. Much that is fundamental with regard to the properties of lime has became a matter of common knowledge to even the smallest manufacturer of lime for chemical uses. The value of constructive and co-operative research work through a national trade association is generally recognized by the industry.

During the past year the National Lime Association has largely increased the equipment of its research laboratory, added to its staff of research chemists and conducted many lines of research through fellowships established in technical institutions, such as the U. S. Bureau of Standards, Ohio State University, Massachusetts Institute of Technology, University of Missouri, University of Tennessee, University of Wisconsin and University of Nebraska.

The association has also been identified with independent lime studies, carried on throughout the year at Cornell University, and elsewhere. The entire program of research work embraces such subjects as the following, which are of leading importance both to the industry and to the lime-consuming public:

1. Lime in the treatment of trade wastes.
2. The solubility of different types of commercial limes.
3. The determination of the true chemical relation of lime to soils.
4. The investigation of physical action of lime to soils, particularly with reference to the improvement of clay soils and dirt roads.
5. The properties of bleaching powder made from different types of lime, and the effect of certain impurities on the absorption of chlorine.
6. The effect of different types of lime in the manufacture of insecticides.
7. The use of lime in sewage disposal.
8. Commercial products derived from the burning of impure limestone.

The National Lime Association has also made definite progress during the year in the development of new lime products for building construction use, and has developed many new data pertaining to the properties of lime as a building construction material. During the year important revisions and new standard specifications for lime in miscellaneous uses have been made by the American Society for Testing Materials. A recognized standard method for the determination of available calcium oxide should prove of great advantage both to the manufacturer and to the consumer of lime. New plant construction, for the most part, has been of newest technical design, and each year's growth of the industry adds more kilns and equipment of a type adapted to scientific operating and to producing a more perfect product. Old-fashioned rule-of-thumb operating methods have been discarded and replaced with modern equipment and technically controlled operation by principal lime producers in all sections of the country. I am certain of the fact that the average product of the lime manufacturers of the United States has been of better quality in 1924 than lime shipped in previous years, and it is not far fetched to predict that the average standard of quality will continue to improve in the future. The lime industry will continue to pursue to a conclusion its present purpose of converting the processes of lime burning, of lime hydration and of lime purification to the exact science that is necessary and deserving for such a basic and essential material.

The lime industry held its own during 1924, the total estimated production being but 2 per cent less than that for the banner year of 1923. It is estimated that 4,000,000 tons was produced in 1924, which at $9.75 per ton would represent a total value of $39,000,000. Thirty-two per cent of the tonnage was hydrated lime and 68 per cent quicklime. Such figures for a year like 1924 bespeak industrial health.

American Flaxseed Crop Needed

1925 Should Be a Banner Year for Linseed Oil and Should Encourage Farmers to Grow Flax

By J. W. Daniels

Chairman, Board of Directors, Archer-Daniels-Midland Co., Minneapolis, Minn.

WE LOOK FORWARD to 1925 with high hopes for one of the best business years America has ever had. The greatest producers of wealth in the United States are the farmers and they have been blessed with good crops. Owing to short crops in other countries and better conditions in Europe, the prices for farm products have been on a very satisfactory basis.

With all kinds of industries optimistic, we feel the demand for linseed oil and the products into which it enters must be on a high level, and we predict the coming year will be the best in history for the linseed oil industry. The demand for our product has grown with the increase in the development of our country.

Flaxseed is raised in most of the European countries in a small way for the purpose of making linen. For several hundred years Ireland has been raising flax. There has been a lot of inquiry during the past year for our flax straw, but up to this time it has not been found suitable for the manufacture of linen. However, there are new uses for flax still being discovered, and I hope it will be only a few years until it is all consumed. In an age when everything is being utilized it is a crying shame that several million tons of flax straw is burned every year. We shall probably never produce linen in a commercial way in the United States, because the process of making linen is almost entirely by hand and labor is too high in this country to compete with Europe.

Russia was the largest flaxseed-producing country in Europe before the war, but since the revolution none of any consequence has come out of that country, so it does not count in present world supplies. Today there are only four countries in the world that produce flaxseed in large quantities—Argentina, the United States, Canada and India. Argentina is very much the largest producer; for the last 4 years its crop has averaged 47,000,000 bushels, but the outlook is for a much smaller crop this year than last. Seed in the Argentine is planted in July and August and harvested in December and January, so it is in the ground about 5 months, while seed in the United States and Canada is harvested about 90 to 100 days after it is sown. Argentine flaxseed is generally sown on land that has been planted to corn and has always been free from wilt and blight. The fact is that Argentine flaxseed has never had any kind of disease, and is always sown on old land, while the custom has been in this country to plant only on new breaking. A number of years ago there was formed a committee of oil, paint and varnish manufacturers to try to make flaxseed a permanent and regular crop in the United States. This work has been carried on through the agricultural colleges of Minnesota, North and South Dakota and Montana. Research work has been done by the colleges along the lines of improving the seed flax, and a strain has been developed in North Dakota and Minnesota, called "wilt-resistant," that has been sucessful on old land and has revolutionized the growing of flax in the Northwest. Our soil and climate are well adapted to the raising of flaxseed, and we need this cereal in the rotation of our crops. The colleges believe flax has a place in the Northwest, and have issued bulletins showing how to prepare the ground, where to buy proper sowing seed, and assuring the farmers that flax is not hard on the soil. They have made experiments at the state farms in growing flax after all kinds of grain, and growing flax with wheat and oats, and have sent out carefully prepared bulletins on all these subjects.

During the war the government urged the farmers to raise wheat and more wheat, so the production of flaxseed reached a very low ebb and we were importing a tremendous amount. In 1923, the United States imported a little more than 22,000,000 bushels of flaxseed from the Argentine and Canada, the value of which was well over $50,000,000. We have imported this year from the Argentine 14,235,000 bushels and more than 1,000,000 from Canada, the value of which is between $30,000,000 and $40,000,000, and for the 2 years almost $100,000,000 has been paid out for an agricultural product that should have been raised in the United States and the money paid to our own farmers.

On the recommendation of the flax development committee of the National Paint, Oil and Varnish Association, based on an assured market for the seed and a protective duty of 40c. per bushel placed on flaxseed by the last Congress, the agricultural colleges have advised increased acreage of flaxseed to the farmers; the result has been that the acreage increased 60 per cent over last year and [*Continued on next page*]

The Importer's Position Difficult

Government Interference and Foreign Trade Practices Are Discouraging Prominent Factors

By Milton Kutz

Sales Manager, Roessler & Hasslacher, New York City

IMPORTATION of chemicals during the past year has been in many cases decidedly unpleasant as well as unprofitable. Foreign producers have not based their sales on cost. As a matter of fact, we are given to understand that, on account of the debased currencies, it has been a difficult matter to get an idea of actual costs. Sales have been made at the price the traffic would bear. The result has been that when offers were made to legitimate handlers, and accepted, there was no guarantee that shipment would be made. A foreign inland handler of chemicals might obtain a special figure for export to some other part of the world and instead of maintaining faith and shipping as promised, the material was very often diverted to this country through dealers not familiar with the situation. They would offer broadcast at prices that permitted no reasonable or even in some case any margin of profit to stable factors in the trade. Of course, under these circumstances and because of governmental activity, such as the anti-dumping law, the importation of chemicals by old-line houses is becoming less interesting. The inexperienced buyers in this country have also tended to lose interest in imported materials, as they have been the losers many times through inability to secure reliable information on which to figure intelligently.

Furthermore, it must be distinctly understood that the present protective tariff has enabled American manufacturers to meet and in many cases to beat foreign competitive prices. As American manufacturers it is, of course, our endeavor to encourage the production of domestic goods except where natural resources do not create an absolutely impossible obstacle. Such a case is potash and its salts. Europe has almost a monopoly on these and it cannot be expected that producers in this country can take care of all requirements. At the same time the potash interests of the United States should be encouraged, that we may prevent a recurrence of the happenings that have handicapped the industry for the last 10 years.

Some of the products of which our company is the principal producer in the United States have not received adequate governmental support and are on the free list. Because of this we have often turned importers in order to take care of our customers. It is our intention to strain every nerve so that we may maintain the position that an American producer should have, as factors in these commodities.

Importing of chemicals during 1924 has not been satisfactory. Should such conditions continue, we are firm in the belief that, unless governmental and other interference is discontinued, imports of many articles will gradually diminish.

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more than 300 per cent over 1921 and 1922. The acreage and estimated crops for the last 4 years are as follows:

	Acres	Bushels
1924	3,375,000	30,173,000
1923	2,061,000	17,429,000
1922	1,113,000	10,375,000
1921	1,108,000	8,029,000

The world produces an average of about 100,000,000 bushels of flaxseed each year, and the United States consumes between 35,000,000 and 40,000,000 bushels, or more than one-third of the world's production, so there is a ready market for the crop we have raised this year, at very satisfactory prices compared with other grains, and we are more than pleased that the farmers have been well paid for their flax crop. We believe they should continue to plant flax in these Northwestern states, as there is a growing market in this country and it is a shame to send $40,000,000 to $50,000,000 a year out of the United States that should go to the farmers of this great Northwest. Most people do not realize what an important crop flaxseed is to the Northwest and how big a place it occupies.

In 1924 we raised the largest crop of flaxseed this country has ever produced, estimated by our government at 30,173,000 bushels. So large a crop 10 years ago would have resulted in an overproduction in this country, but this year the crop has been absorbed at very good prices to the farmers, and we shall be obliged to go to the Argentine and Canada for 10,000,000 to 12,000,000 bushels more to supply our needs. Argentina raised 60,000,000 bushels of flaxseed in 1924—the largest crop ever raised in one year in any country in the world's history; the crop in that country in 1925 will not exceed 40,000,000 bushels, or 20,000,000 bushels less than last year. With our crop already absorbed and a short crop in the Argentine, it looks as though prices would be on a high basis this spring and summer.

Chlorine Industry Seeks New Markets

Large Productive Capacity of the Industry Not Utilized in Supplying Present Needs

By E. D. Kingsley

President, Niagara Alkali Co., New York City

IT IS NOT a new observation to remark that the chemical industry does not on the whole receive adequate compensation for the services it renders to society, but it is well worth repeating. Moreover, the chlorine part of the industry does not always share in any relative prosperity that the whole chemical industry may have.

Bleaching powder during the past year has continuously sold for less than pre-war prices, on the basis of a dollar having the purchasing power of about 65 cents. Statements of this kind are often met with the retort that the price is intrinsically too high, but this is not in accord with the facts. On a per capita basis the American public in 1924 spent about seven-tenths of one cent for the indispensable chlorine for drinking water, and in 1914 the figure was about the same.

The industry is now largely on a liquid chlorine basis and as a result the cost of packages, whether they be tank cars of various kinds or cylinders, is of the utmost importance. In the case of the tank car it costs at least $500 to package $9,000 of commodity per annum and in the case of cylinders $2 to package $48 of commodity. These figures speak for themselves. The investment in packages is therefore large and the industry must exercise every care to secure quick return of empty packages, and it is entitled to a chlorine price based on a fair and adequate return, including packaging costs.

The industry has not been occupied, during 1924, to anything approaching capacity, and has therefore been engaged in intensive study of markets, its methods of manufacture, the extension of the present uses of chlorine products and the development of new uses. The utilization of hydrogen has become important and several chlorine makers are now furnishing hydrogen for ammonia manufacture. This does not mean that chlorine will be made in order to have ammonia, but it is an economic advance and one less waste. Still other chlorine manufacturers have turned hydrogen to other uses within or without their plants.

The use of chlorine compounds as solvents, insecticides, fumigants, antiseptics, fire extinguisher liquids, cleaning fluids, anesthetics, freezing compounds and in organic synthesis increases slowly but steadily. There are promising developments in the petroleum field, and a steady increase in the use of chlorine products in sewage and industrial waste disposal and in the treatment of waste gases having offensive and harmful odors. The recent fine work of the Chemical Warfare Service in chlorine treatment for colds and other infections of the respiratory system is causing a very general adoption of the treatment throughout the country, and will undoubtedly lead to still other discoveries of use and benefit to everybody. The present capacity of the industry, however, is more than sufficient to take care of the newer things, and still more outlets are necessary for the industry to operate on a high plane of economic usefulness.

Chlorination of drinking water supplies has become general in American and Canadian communities of more than 1,000 population irrespective of the nature and source of the water supply. The results are the lowest typhoid and other water-borne disease rate in history. Nobody well qualified to express an opinion on this matter longer doubts the necessity and the efficacy of the chlorination of water supplies. It has taken more than ten years time to bring about the safety of American and Canadian potable water supplies, and the Electro Bleaching Gas Co. has the honor of being the pioneer in the field with liquid chlorine in this important work. Another important and growing use of chlorine is in the chlorination of the waters of indoor and outdoor bathing pools and bathing beaches.

With a view to the promotion of the present and new uses of chlorine products, a number of manufacturers in March, 1924, incorporated the Chlorine Institute, Inc. It is a no-capital-stock corporation organized under laws of the State of Connecticut. Its very modest resources are being devoted to the study of chlorine products generally and it has recently, after considerable preliminary investigation, decided to engage in research in two large fields—namely, the chlorination of sewage and the bleaching of cellulose. It will require time and patience to achieve measurable results and even though the results in both cases might be negative in some ways, the training, the discipline and the general increase in knowledge cannot help but be valuable. The chlorination of sewage and cellulose are, of course, already conducted on a large scale, but there is ample room for improvement and [*Continued on next page*]

Optimism Needed in Insecticides

Fundamental Changes in Business Methods Now Under Way Will Benefit the Industry

By R. N. Chipman

President, Chipman Engineering Co., New York City

OPINIONS differ concerning the fundamental conditions within the agricultural insecticide industry. This variance of thought is largely due to the unprofitable nature of the selling prices. Some manufacturers see only the destructive influence of such a condition, while others feel that constructive work is going forward so that in the near future benefits of a far-reaching character will accrue. The history of economics undoubtedly proves that periods of privation bring forth great developments, and the circumstances surrounding this subject should prove no exception.

It is admitted within the industry that manufacturing as well as raw materials costs are approximately the same for every company but that selling prices show great variation throughout the trade. Today it is generally acknowledged that these selling prices have no factor of overhead included in them and that, therefore, every pound manufactured and sold is creating a loss in the ultimate balance sheet at the end of the year. There is reason for the optimist to believe that improved conditions will follow, a condition in which overhead costs must be fundamentally revised. The cost of overhead as generally interpreted in a well-regulated business should include only the necessary supervision, the cost of capital and the necessary expense of selling according to normal business practice.

The overhead in the insecticide industry, however, has not followed this simple logical plan with respect to the item of sales cost, for in this industry contracts between seller and buyer are mere scraps of paper until the final day of reckoning. This is a variable feast held at any time that insect invasions and crop conditions permit and in accordance with the ability of the buyer and the disposition of the seller. Sales are made without a price or definite settlement date; insecticides have been shipped on consignment and on any other loose arrangement which a manufacturer may find suitable to prevent another manufacturer procuring his customers. Overhead costs have included all of these unnatural business conditions and the optimist now believes that the overhead is cut to such a low figure that proper business methods will be forced to follow.

There is evidence that substantiates the optimist in this, for certain companies are quoting their lowest prices for immediate acceptance and for delivery on short terms of settlement. Forward positions are being contracted for at higher levels with differentials that vary with the lateness of the month of delivery. In case long terms are allowed there is insistence that the transaction be adequately covered by trade paper so that no dispute can occur at time of settlement. Discounts are provided for cash payments, guarantees against decline are being eliminated, and in this way excessive overhead is irrevocably reduced, because the buyer will so appreciate the reduction in overhead that he will no longer ask for the old conditions to be resumed. There is widespread approval of lower selling prices in the fall and higher prices for the spot market in the spring, but it has taken a more powerful agency to bring about this condition. This agency is the economic law of supply and demand, which has so reduced the prices that unless proper merchandising methods are used no company can continues successfully. This desirable condition with a fairly stable raw material market will produce a sound business, and I have joined the optimists in their opinions in this regard.

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for increased use of chlorine. Any work on the sewage menace is valuable, and anything that will diminish the losses in the wood resources of the United States and Canada will be of great benefit to everybody.

Chlorine is a real index of civilization, and the well being of a community may be gaged by its use of chlorine and a general interest in its many values. The chlorine industry is essentially a key industry and a vital element in the national defense at no expense to the taxpayer. Chlorine products should be used and not wasted in any operation. The industry is trying to develop real uses. That chlorine products have limitations in certain applications is recognized, but that all possible uses are known is far from being ascertained. A wider and economic use is bound to stimulate the technique of manufacture and that in turn may lead to valuable improvements in electrolytic operations generally. The industry has a recognized place in the industrial fabric as a result of much hard work and capital expenditure. It deserves well at the hands of the consumers and the public because it endeavors to furnish good products and a service not entirely selfish.

Industrial Alcohol Has Good Year

"The Eliza in an Uncle Tom's Cabin With the Cramton Bill as a Bloodhound"

By Sidney Klein

Vice-President, Kentucky Alcohol Corporation, New York City

THE YEAR 1924 was a good year for industrial alcohol. Developments tended toward a much-to-be-desired stabilation, which, when finally realized, will prove beneficial to both consumer and producer.

A survey of the controlling factors in the order of their influence upon the industry will make the situation clear.

Molasses brought a price at the beginning of 1924 100 per cent higher than that of a year previous. As the season progressed, competitive bidding by the alcohol manufacturers and cattle feeders raised the price on the remainder of the crop, which was entirely sold out by midsummer. The size of the crop was inadequate to meet the demands placed upon it. Cuba is the largest and most dependable source of supply for molasses, and, under average conditions, approximately 200,000,000 gal. is produced on the island annually. Therefore a shortage of raw material causes the inevitable law of supply and demand to affect alcohol products.

Grain was sent to the bat as pinch hitter, because even with the prevailing high prices of this material and the corresponding higher cost for producing alcohol, the consumers' interests were served at the expense of profits.

Consumer demand for industrial alcohol has had a decided increase during the year. Its consumption as a chemical will continue to register the progressive gains which have been established from year to year. While some industries using alcohol were experiencing depressions, others called for increased quantities, and the outstanding new development—cellulose lacquers—exerted its full influence only after mid-year.

Tremendous expansion is being evidenced in the increasing and unsatisfied demand for alcohol as an anti-freeze solution for automobile radiators. Here it is appropriate to quote from an address on the subject, "Some Recent Developments in Industrial Alcohol," delivered before the American Chemical Society at Washington, D. C., last April by Dr. J. M. Doran, head of the industrial alcohol and chemical division, Bureau of Internal Revenue:

"Probably the greatest increase in the volume used during the past 2 years has been as an anti-freeze solution for automobile radiators. The necessity of a satisfactory anti-freeze solution, in order that transportation may be maintained throughout the winter months in the large industrial centers of the Northern States, is apparent. Denatured alcohol fulfills this need admirably, and to date it is the only material that has proved satisfactory for this purpose."

Consequently anti-freeze is strictly a seasonal product, in use between Nov. 1 and March 15. For many reasons automobiles in greater numbers are kept in constant service throughout the low-temperature period of the year. Formerly it was the custom to put machines in storage about the time moth balls were shaken out of fur coats.

Production capacity was adequate to take care of the increased anti-freeze demands, but it behooves either the producers or the distributors, or both, to adopt new methods for distribution. The petroleum industry has met a similar situation by providing facilities for storage and warehousing of such material as can be produced between seasons and thus meet extraordinary consuming demands. In the alcohol industry the period of active buying coincides with the busiest period of industrial activity.

Therein lies the trend that will bring about the stabilization of the whole industry. With it will come the accruing advantages, such as maintaining continuous production operations throughout the year, applying the more modern merchandising practices in the sale of products, the effecting of economies and the bettering of service through improved distribution facilities. Regardless of improvements within the industry, price levels of alcohol will be influenced entirely by the fluctuating cost of the raw material and the demand. These factors remain the yardstick of valuation.

During 1924 industrial alcohol continued to play its "Uncle Tom's Cabin" role of *Eliza* pursued by the Cramton bill and the stipulation of "H" and "denatured alcohol" permits. The latter, an Internal Revenue Department ruling, was wisely withdrawn, following an avalanche of protests registered by general trade associations in the drug and chemical fields, by the specialty groups of such associations, and even by individuals, all of them legitimate users of alcohol in the fabrication of non-potable products. This is an excellent example of the [*Continued on next page*]

Naval Stores Activity Marked

Rosin and Turpentine Have Interesting Market History in 1924

By J. C. Nash

Vice-President, Columbia Naval Stores Co., Savannah, Ga.

THE most striking feature in naval stores from the market or value point of view was the low price of rosins, and this article has been one of the few raw materials that up until Sept. 1, 1924, has remained almost continually below the pre-war average price and in my opinion has been for the past 2 years below the cost of production. It is true that during this period there was a fairly large visible supply. It is also true that during this period of low prices its very cheapness has popularized rosin and during the past year its consumption has steadily increased until at this time the exports are back to the heavy pre-war volume and the market during the past 4 months as a result of this has advanced about 40 per cent. In my opinion this advance has been fully justified, for it has come at a time when the exports of rosin (and exports comprise approximately half of the crop) have increased 35 per cent over the previous year, besides which there is no doubt about the fact that a number of new uses have been found for so cheap a raw material, and these uses give every evidence of continuing with the growing needs of an expanding world.

A brief picture of the statistical position may be gained from the statement that the stock of rosin on hand at the close of 1924 at the three statistical ports is only 254,000 bbl. against 345,000 bbl. a year ago, in addition to which there is evidence that the stocks held in the interior are between 50,000 and 100,000 bbl. less than at the same time last year. This heavy decrease in the available supply should be borne in mind.

A somewhat different picture confronts us in the allied article turpentine, for the stock at the three statistical ports is roughly 60,000 bbl. this year, against 38,000 bbl. last year, and while the interior stocks may be slightly less than those of a year ago, they are not, in my opinion, appreciably less. The price is about 10 per cent less than it was a year ago and the consumption has been somewhat less due primarily to the use of substitutes for pure turpentine. Turpentine for the past several years has ranged above the pre-war level and the price outlook today is without particular feature. In spite of the easier statistical position of this article, there is a decided sentiment in its favor throughout the South, as with the prospects of smaller crops ahead of us due to the decreasing supply of available timber, it is believed to be so near the cost of production as to make further price recessions unlikely. The crop as a whole, both rosin and turpentine, is expected to show a decrease of 5 per cent as compared with the previous crop.

Looking at the broader aspects of the naval stores situation aside from the market conditions, it seems opportune to report that commencing with the meeting in Savannah in February, 1924, an effort has been made to bring about a greater co-ordination of the varied interests of the industry as a whole. A committee was appointed at that time to report upon the desirability of a trade organization covering each branch of the industry, and that committee is now ready to report back to another meeting to be held this coming February. It is prepared to suggest that a Pine Institute of America be organized corresponding in the scope of its activity with the Institute du Pin, which similar organization looks out for the naval stores interests in France. It is also a matter of interest that a commission of naval stores men from the Southern States authorized by the Department of Commerce visited France last summer to study French methods of production, and as a result of the work of that commission numerous improvements are now being installed throughout the South looking toward more economical methods of distillation and greater conservation in production.

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results that can be obtained through concerted action. Industrial alcohol, since it has been subjected to so much legislation, regulation and control, has been held on a basis comparable only with narcotic drugs. Both have their uses and abuses; the one is used for very restricted purposes and in small units, while the other is used for the widest range of purposes and in units up to millions of gallons. This naturally militates against the fullest development of industrial alcohol at a rate that would be considered normal were it held on the same footing as other chemicals such as lime, sulphuric acid, phosphates, etc. Its development should receive encouragement rather than narrowing restriction. However, the industry has fully demonstrated it hardihood by reaching its present status, and by moving forward each year.

Fertilizer Industry on the Mend

A Trying Period Is Past and With Good Prospects There Is Reason for Optimism

By C. F. Hagedorn

Vice-President, Armour Fertilizer Co., Chicago, Ill.

THE fertilizer industry has passed through an unusually trying period the past year. Unsettled agricultural conditions have made selling and collecting difficult, and during the last spring season the situation became decidedly demoralized. However, conditions have somewhat improved and it appears at this time that the industry has definitely turned the corner.

Today a dollar invested in fertilizers will buy plant food to produce more dollar value in crops than would a dollar so invested in 1913. For instance, in the South a dollar invested today in high-analysis fertilizers will bring practically double the net return in dollars that it would have brought in 1913. The reason for this is the fact that selling prices of farm products have increased proportionately more than the selling price of fertilizers. To keep going under existing market conditions in the face of the general tendency of upward costs of doing business, such as increased cost of materials, higher labor rates and materially higher freights, has been most difficult. Only by the most rigid economies in manufacturing and almost complete elimination of profits has this result been secured.

> It is estimated on good authority that in the season of 1923-24 there was shipped as much total plant food as in any year in the history of the industry, although almost a million tons less fertilizer was shipped than in the highest year. Higher average analysis was the reason. To what extent the high-analysis work can be carried with safety we cannot say at this time, but it is most likely to continue upward for some time to come to compensate for the upward trend of freight and labor.

Freight rates (representing probably an increase of 50 to 75 per cent in 1924 over pre-war years) have added a considerable amount to the spread between manufacturer and farmer. This unusual condition may represent the general industrial changes brought about by the war, but the facts are that it has added to the cost of fertilizers approximately $3 per ton, combining incoming and outgoing freights.

The additional cost going into the operation of our railroads is an illustration of what has taken place in all industries, including our own, which always must widen the gap between raw materials and finished products.

The fertilizer industry undertook in 1922 to reduce the large number of analyses and to educate the trade to the use of analyses carrying a higher total of plant food units. The idea at first was to establish an arbitrary point of difference between high and low analyses. By common consent all analyses carrying 14 per cent of plant food and above were to be called high, and those under 14 were to be designated as low. This proved to be a popular move in the right direction and was immediately followed by reducing the number of analyses. The manufacturers were invited by the agronomists of the Middle West to join them in a campaign along this line. This meeting was held in the Blackstone Hotel, Chicago, on Oct. 20, 1922. The consequence has been the adoption by many of the states of a number of standard analyses recommended to the farmers for use on given crops. Ohio was the first to announce its "standard dozen." The idea was to get away from the multiplicity of brands and the low analyses as rapidly as consistent with good business and agriculture. The change would have to come about slowly, as is the case with all changes in agricultural practice.

The history of the efforts on high analysis probably dates back to the closing of the World War, when freight rates first entered vitally into the problem of complicating distribution. The manufacturers and professional men have advocated high-analysis goods since 1918, and the campaign has been more intensive every year since.

In some sections the results have been suprising. The State of Indiana may be cited as an example of what is now taking place in the direction of this change. The following table shows tons of fertilizer in Indiana:

Mixed Fertilizer Tonnage

	High Analysis	Low Analysis
1919	43,129	120,035
1920	52,881	84,760
1921	59,804	55,887
1922	89,527	43,549

As one of the recent writers on the subject has well put it, "The tendency in Indiana is unmistakable and is confirmed by reports from all over the country."

The local merchant performs a service as well as a duty when he makes it possible for his farmer customer to buy his necessities of food, clothing and what-not without the delay of ordering from a primary market, and in furnishing proper credit till harvest. The farmer has been confused by attempting to compare this cost and service with the price of fertilizers obtained through a co-operative buying association, where he must deposit the cash in advance. If he bought fertilizer from the local merchant, he could obtain the brand of goods he desired when he wanted them and pay for them as he does for his groceries.

An Industry Comes Into Its Own

Manufacture of Organic Chemicals Reaches Mature Proportions by Developing Sidelines

By J. Warren Kinsman

Assistant Director of Dyestuffs Sales, E. I. du Pont de Nemours & Co., Wilmington, Del.

FOR SOME YEARS it has been customary to measure the progress of the American organic chemical industry by the achievements of its most popularly known branch, dyestuffs. But while synthetic colors still retain the premier position, it is now necessary to give attention also to those various classes of compounds that are recognized as being essential to the profitable manufacture of the parent group from which they grew. Instead of the familiar reports on dyes, pharmaceuticals and photographic chemicals, one must today consider also advancements in the development and use of rubber vulcanization accelerators, flotation reagents, gas-motor anti-knocks, synthetic resins, disinfectants and insecticides, as well as several minor classes, all of them reflecting the industrial advance of the past few years.

Fundamental influences of an international character were felt here during the past year, chief among them being the annulment of the contract between the French and German manufacturers and the rejection by the British Government of the merger between the German Cartel and the British Dyestuffs Corporation. Subordinate to these negotiations were the amalgamation of the principal French chemical manufacturers and the consolidation by the members of the German Cartel of their various selling organizations in the Far Eastern countries.

The United States Department of Commerce contributed inestimable aid toward the year's accomplishments by compiling splendid reports of the dye manufacturing industries in the primary foreign countries and also through providing consular reports of the conditions in the major dye-consuming markets of the world.

Nearly 180 new dyestuffs were introduced in 1924, many being of the vat or similarly complex type. But the greatest progress is probably to be found in the general improvement of quality in all existing brands and the utilization of certain byproduct wastes. Substantially all the American requirements for dyes are now provided by the domestic chemical industry; the only imports consist of high-priced colors not handicapped by the tariff, but even some of these are losing favor, as consumers find them inferior in quality to corresponding American products. A general business stagnation in most of the important dye-consuming trades during the spring and summer of 1924 forced a curtailment of production that will hardly be counterbalanced by the renewed activity in nearly all of the important consuming industries toward the close of the year just passed.

The reduction of 25 per cent on Sept. 22 in the ad valorem duties on dyes and organic chemicals, as provided by the tariff act of 1922, had no especially adverse effect on domestic trade in general, although the lowered rates permitted an influx of large quantities of the higher valued colors, principally the vats or those competing with them. It must be recognized that the customs authorities have so ably administered the dye and chemical provisions of the new tariff law that they have contributed much to the protection of the domestic producers. Contrary to the contentions of opponents to that act, improvements in quality and the results of research for more economical processes, coupled with the keenness of competition among American suppliers, have benefited the consumer until, as one authority points out, our government's statistics show that American dyes, based on the prevailing value of the dollar, are being sold to American buyers at cheaper prices than were German dyes before the war. It is significant that, while the imports for the first 11 months of 1924 were slightly smaller in volume, they were proportionately greater in value than for the corresponding period of 1923 and that more than 35 per cent were delivered in October and November, thus reflecting the successful operation of the tariff against all dyes excepting the higher priced varieties.

Incomplete returns for the year 1924 show that for the first 11 months the exports of dyes and intermediates, principally to China and Japan, with smaller quantities to India, South America and other miscellaneous markets, fell about 11 per cent in quantity below the record for the same period of the previous year. This decrease may be attributed chiefly to Japan's smaller purchases during the recovery period that followed the earthquake of late 1923 and the interruption of all business in eastern and northern China while the political war was waged in the vicinity of Shanghai, the main distributing center for dyestuffs. As usual, indigo, the most important color for the Orient, still ranks first in exports from the United States.

Rubber Accelerators. Without that group of organic

chemicals now known as accelerators to promote the efficient vulcanization of rubber products it is certain that our automotive industry would have lagged far behind the present stage of its remarkable development, for it cannot be denied that much credit must be given to the quality of the modern rubber tire for bringing the cost of motoring and truck transportation to the current economical level. There are less than ten important rubber vulcanization accelerators in wide commercial use, a splendid condition from the viewpoints of manufacturer and consumer standardization, but many more have limited application for specific purposes. Since a number of the largest rubber companies still regard the use of accelerators as secret processes and make many of those organic chemicals in their own factories, it is not possible to determine the total quantities produced and consumed in this country. Nevertheless, the manufacture of accelerators has become within the last 5 years one of the most important fields to which the dyestuffs industry has turned its efforts.

Flotation Reagents. The metals mining industry, principally that section of it engaged in the production of copper, zinc and lead, with gold and silver as essential byproducts, has given much attention lately to the use of organic chemicals of definite composition as substitutes for the heterogenous oils, obtained from the distillation of coal and wood, which have been used since the inception of the flotation process 15 years ago. Scientific research has developed several compounds of substantially higher unit value than the mixtures they replaced and which are now employed on an extensive commercial scale to separate by flotation methods the metal sulphides from the gangue. Indeed, even the sulphides of the different metals are separated by selective flotation through the use of such chemicals. Not only have the organic flotation reagents decreased the cost of recovery but they have improved also the percentage of yield as well as the quality of the metal concentrates. From the well-known dye intermediates, alpha-naphthylamine and mixed-xylidines, this development has now passed through the use of thiocarbanilide and ortho-toluidine to the ethyl xanthates of sodium and potassium.

Anti-Knock Compounds. Stimulated by a realization of our waning petroleum resources, research was undertaken several years ago to develop not only substitutes for gasoline but also means to conserve and extend the existing supply for our rapidly mounting needs of motor fuel. Pending the ultimate solution of this problem, the most important advance in the conservation of our available gasoline stocks is the development of the so-called anti-knocks, which adapt commercial grades of gasoline to use in high-compression gas motors, a type that is far more efficient in its ratio of power delivered to fuel consumed than those installed in autos of prevailing design. Tetra-ethyl lead, the active ingredient of ethyl gas, is as yet the only commercially important compound of this class and its national distribution may be viewed as foreshadowing radical changes in the construction of automobile motors.

Disinfectants and Insecticides. Closely allied chemically to some important intermediates and therefore logical for the dyestuff manufacturer to produce are certain disinfectants and insecticides that have properties which adapt them to sterilizing seeds and bulbs against a multiplicity of plant diseases or against many of the insects and fungi that cause enormous annual losses to agriculture. Only a few of these new organics are being marketed at present, but research is in progress and extensive field experiments are under observation in preparing for the commercial distribution of many other compounds of this class.

Research Chemicals and Stains. Of less importance to our independence from foreign sources only in so far as they are required in smaller quantities than dyes and other tonnage commodities are the organic chemicals and biological stains required for research purposes. From a modest start, there are now available from American firms more than 1,800 research chemicals of a quality superior to the pre-war standards, and with the dozen principal biological stains already produced in the United States, the remaining eight or ten essential ones are promised during the coming year.

Synthetic Resin. By excellent commercial development of new uses for the products and by taking advantage of their remarkable working properties, there has grown a new branch of the American chemical industry—namely, synthetic resins. The versatile uses for these resins place them among the most important of recent achievements from either an industrial or a technical viewpoint.

What of the Future?

In the writer's opinion the most trying years in the establishment of an organic chemical industry in the United States are now passed. Forecasts are always dangerous, but it is only necessary to review the progress made since 1914—and especially that of 1924—to understand why the American industry faces with complacency and confidence whatever development the future may bring.

Fewer Dyes Imported in 1924

Preliminary figures compiled by the collaboration of the chemical divisions of the Bureau of Foreign and Domestic Commerce and the United States Tariff Commission show that the imports of synthetic dyes during 1924 were 2,825,990 lb., with a value of $2,830,698. This represents a decrease of 272,203 lb. and $320,665 from that of 1923. Table I shows the imports of coal-tar dyes for 1924 and for the years 1920 to 1923, together with the imports for the fiscal year 1914. The final figures for the dye imports of 1924 will be published by the Tariff Commission in the Census of Dyes and Other Synthetic Organic Chemicals for 1924.

Table I—Imports of Coal-Tar Dyes, 1914-1924

	Lb.	Value		Lb.	Value
1924*	2,825,990	$2,830,698	1921	4,252,911	$5,156,779
1923	3,098,193	3,151,363	1920	3,402,582	5,763,437
1922	3,982,631	5,243,257	1914	45,950,895	9,502,714

*Preliminary figures.

It will be seen from Table II below that there was a gradual decline in the monthly importation of dyes just prior to the reduction in duty in September. The larger part of the imports during September came in after the 21st, under the reduced duty. Imports during October, the month immediately following this reduction, reached a maximum of 440,000 lb.

Table II—Imports of Dyes at New York in 1924

Month	Lb.	Value	Month	Lb.	Value
January	288,743	$232,571	August	64,546	$71,290
February	158,874	176,657	September	152,978	159,620
March	293,862	302,016	October	440,466	455,787
April	174,880	182,253	November	359,260	351,887
May	167,245	165,521	December	314,673	283,655
June	147,380	151,331			
July	140,810	137,075	Total	2,643,482	$2,662,520

Progress in Terms of Volatile Solvents

Pyroxylin Lacquers and Other Great Commercial Developments Are Reflected in This Branch of Chemical Industry

By Burnell R. Tunison

U. S. Industrial Chemical Co., New York City

IN ORDER to review the development in the production or utilization of solvents, it is necessary to have available fairly accurate information concerning the production so that the essential comparisons may be valuable or interesting. Unfortunately, those engaged in the chemical industries are not generally disposed to inform the industry at large, and their competitors in particular, what they are doing. There are a few exceptions, which are principally due to the fact that governmental agencies are concerned with the compilation and publication of data regarding the activities of certain industries. These published figures, together with a few reliable estimates, make a very interesting picture of the operations which they concern.

Inasmuch as a number of solvents such as alcohol and the products from coal tar and petroleum are being discussed in other sections of this publication, they will not be included here. The official figures available for the production of some of the more important solvents are given in Table I. The production of such materials as chloroform has become a well-regulated and steady proposition. About a million and a half pounds per year is produced and there is little variation in output. Due to the fact, however, that the price of chloroform has been comparatively high, there has been no expansion of its use as a solvent, but probably a restriction, and for the same reason in the future it will undoubtedly become less important as a solvent.

Carbon tetrachloride, which for a number of years was also fairly stable, has had a steady increase in production since the war. Undoubtedly its increased utilization for fire extinguishers and its use as a component of proprietary cleansers has had much to do with the increase of late. During the past year the price of carbon tetrachloride has been low enough that a considerable solvent demand has been developed. While no accurate figures are available, the producers estimate that nearly 20,000,000 lb. was produced during 1924. Whether the consumption that has developed during the last year will continue during higher prices is a question that only an increase in price will prove.

During the war, the plants of the country for the production of sulphuric ether were greatly expanded. After the war, the greater production capacity precipitated a competitive situation that resulted in lower prices and the development of new uses. Probably the greatest development for the use of ether is the successful operation of a plant producing artificial silk by the Chardonnet process. Many new uses are being developed for ether and it is likely that the production will increase. The wood-chemical plants of this country have been going through a very critical period during the past few years and 1924 brought much to shape the destiny of the industry. Of the three principal products—calcium acetate, charcoal and crude methanol—at least one must be distributed at a good price in order to show a profit on plant operations. At the beginning of 1924, the stocks of both calcium acetate and methanol were unusually high and it was necessary to sell charcoal for practically nothing. Although considerable quantities of calcium acetate were exported and utilized for other purposes, the use in the production of acetone was a most important one. During last year, acetone from acetate of lime found a very serious competitor in acetone made by fermentation. The preceding year contamination difficulties in the process yielding acetone and butyl alcohol restricted the production of both these commodities far below the demand. As a result, the price of acetone was relatively high and many of the wood chemical and acetone plants were in operation. As the contamination difficulties were controlled and the market had to absorb greater quantities of acetone, the price gradually receded to half.

The production of methanol last year for the first 10 months was 5,804,569 gal., as compared with 8,593,727 gal. for the year 1923. The decrease in production

Table I—Progress in the Production of Solvents, 1914-1923

	1914	1921	1922	1923
Methanol, gal.*	.....	.....	6,808,911	8,593,727
Acetone, lb.	10,425,817	4,380,100	.....	8,742,805
Carbon tetrachloride, lb.	(about 10 million)		11,166,318	13,513,644
Chloroform, lb.	1,333,954	944,303	.....	1,805,083
Ether, lb.	2,120,082	3,763,300	4,017,043	5,104,157
Ethyl acetate, gal.	.....	5,310,688	16,114,458	25,887,720
Amyl acetate, lb.	1,315,730	636,000	1,692,074	3,207,022
Butyl acetate, lb.	.....	.....	2,467,506	1,816,086
Butyl alcohol, lb.	(Estimated)	Over 2,000,000	Approx. 4,000,000	.....
Amyl alcohol, lb.	.....	112,384	.....	1,130,000
Isopropyl alcohol, lb.	.....	.....	256,868	.....

* For 10 months of 1924, the Census reports 5,804,569 gal.

was accompanied by a decrease in stocks from 2,632,633 gal. to 1,526,678 gal. at the end of October. The consumption of methanol seems to be decreasing to some extent as less dangerous and inexpensive substitutes are found.

Because of the restricted production and unsatisfactory margins of profit, many of the wood chemical and acetone plants were not in operation, while others, as well as methanol manufacturing plants, operated at part capacities. During the year the total wood chemical capacity of the country was reduced from an average of 5,300 to 4,650 cords per day, and of the total capacity only 10 to 20 per cent was in operation.

Many of the solvents compete for use in the nitrocellulose industries. The progress in the use of nitrocellulose lacquers, not only to replace paint and varnish materials but for many new uses, has been remarkable. The Department of Commerce states that the production of pyroxylin lacquers and enamels in 1923 was 2,353,474 gal., as compared with a production of 1,409,280 gal. in 1921. The production in 1924 will exceed any former figure by a large margin and will indicate an industry several hundred per cent greater than in 1921. This tremendous expansion of the lacquer business has resulted in a corresponding production of solvents.

Inasmuch as ethyl acetate is the most important nitrocellulose solvent, its production was greatly stimulated by the greater use of lacquers. This was offset to some extent, however, by the fact that the manufacturers of artificial leather, particularly for the automobile trade, suffered a decreased production. The greater production of closed cars resulted in a smaller demand for artificial leather and the more modest requirements of the artificial leather manufacturers were felt by the solvent manufacturers.

The successful utilization of finishes of gums and nitrocellulose for automobile use caused an abnormal demand for higher boiling nitrocellulose solvents. During 1923, the production of butyl alcohol and butyl acetate was small, because of fermentation difficulties. This caused a greater demand for fusel oil and amyl acetate. Fusel oil being a byproduct with a limited production, an acute shortage of high-boiling solvents soon resulted. In fact, so great was the demand that the importation of fusel oil and amyl alcohol reported by the Department of Commerce amounted to 3,175,558 lb. in 1923, as compared with only 150,368 lb. in 1922.

Although approximately 15,000,000 lb. of butyl alcohol was produced in 1924 and a maximum of fusel oil obtained, the demand for these products and their esters still exceeds the supply. With the greater demand, increased facilities and production of butyl alcohol have taken place. This resulted in the production of large quantities of acetone. This acetone, in competition with that produced from acetate of lime, has brought about a situation that is serious. Approximately 10,000,000 lb. of acetone was produced in 1924.

The lack of adequate supplies of high-boiling solvents and modifiers for nitrocellulose solutions has stimulated a considerable amount of research. That this investigational work was productive is evidenced by the number of solvents now being offered for this purpose.

Attempts have been made to use methyl acetone and acetone oils in lacquer solutions. The degree of success has not been marked. They are active solvents, but the odor of the materials, along with their evaporation characteristics, made them better for use in a product such as artificial leather or paint and varnish removers than as solvents for lacquers.

Methyl acetone is a byproduct obtained in the refining of methanol consisting of methyl alcohol and approximately 70 to 80 per cent methyl acetate and acetone. Acetone oils are byproducts obtainable in the refining of acetone and are composed largely of higher boiling ketones.

A plant on the Pacific coast operating during the war produced as a byproduct in the manufacture of acetone from kelp some mixed acids and their salts. It had not been possible to work out a successful commercial use for these materials until last year, when the esters of these acids were tried in lacquer solutions. The acids were propionic, butyric and valeric and the esters used for lacquers are the ethyl, propyl, butyl and amyl. They have worked out very well and are now being regularly produced.

Absolute Alcohol Finds Its Place

In the extensive search for materials that would take the place of high-boiling solvents for lacquer purposes, it was found that anhydrous alcohol and solvent mixtures of various descriptions anhydrous in character gave important results. One of the chief reasons for the use of high-boiling solvents was to prevent the precipitation of the nitrocellulose by moisture or "blushing." During humid weather most lacquers were subject to blushing and the use of anhydrous solvents has made possible the construction of lacquers that will not blush.

The fact that in general the gums used for lacquer purposes are soluble in alcohols and not in esters, and that the nitrocellulose is generally soluble in esters and not in alcohols, sometimes makes it difficult, if not impossible, to make homogeneous solutions of the required proportions of gums and nitrocellulose. By the use of anhydrous alcohol it is possible to reduce the ester content of lacquer compositions so that the solvent not only dissolves the nitrocellulose but is low enough in ester content that perfect blends with the various gums are possible. Then by adding the proper modifiers, non-solvents and solvents, any desired result of flow and rate of drying can be obtained.

Another important solvent the use of which is increasing rapidly in the manufacture of lacquers is ethyl lactate. It is a more powerful solvent for nitrocellulose than any of the ordinary products at present in use. Nitrocellulose solutions in ethyl lactate will stand greater dilution with non-solvents than other solvents. Ethyl lactate remains an active solvent even after contamination with as much as 25 per cent of water. It gives good flowing properties and prevents "blushing."

In a brief review with little statistical information available, it is possible to mention only a few of the high-lights in the solvents industries. The field of solvents is a broad one involving countless manufactured articles essential to every household. Furthermore, the future growth of the chemical industry in this country will necessitate the production of a greater variety of solvents in larger quantities. As this progress is made, it is to be hoped that the leaders in the solvents industries will take a broad enough view of the situation so that data may be available concerning production and prices. Such information may be of considerable assistance in the further and more rapid development of the industries.

The Tariff in Chemical Industry

Work of Tariff Commission in 1924 Bears on Many Chemical Commodities

By Thomas O. Marvin

Chairman, United States Tariff Commission

THE Tariff Commission, during 1924, the second year of the operation of the so-called flexible provisions of the tariff act of 1922, received applications for changes in the duties on six chemical commodities. This represents a marked reduction in the number of applications received during the previous year, when thirty-four applications in respect to chemicals were received, Of the applications received during 1924, three were requests for decreases in duty and three for increases. At the present writing the commission has not instituted an investigation of any of these commodities. Since the passage of the tariff act of Sept. 21, 1922, the commission has ordered thirteen chemical investigations, however, and of these, eleven have been completed.

The first chemical investigation under section 315 of the act of 1922 to be reported to the President by the commission was that of sodium nitrite. It will be recalled that during the investigation the Norwegian Nitrogen Products Co., the American representative of the Norwegian manufacturers of sodium nitrite, petitioned the Supreme Court of the District of Columbia to issue a writ of mandamus to compel the commission to disclose costs and other records of the domestic producers. On April 18, 1924, the Supreme Court of the District of Columbia decided the case in favor of the Tariff Commission and refused to issue the writ of mandamus sought by the petitioner.

Following this decision the commission, on April 26, 1924, transmitted its report on sodium nitrite to the President. The commission's report showed that Norway was the principal competing country, that the duty of 3 cents per pound did not equalize the difference in costs of production in the United States and Norway, and that the increase in duty necessary to equalize the differences in production costs within the limitations of section 315 was 1½ cents per pound. On May 6, 1924, the President issued a proclamation increasing the duty on this product from 3 cents to 4½ cents per pound, the maximum increase permissible under section 315. The duty became effective 30 days after the date of proclamation.

The report of the commission in the investigation of barium dioxide was transmitted to the President on May 14, 1924. It showed that the differences in production costs in Germany, which was found to be the principal competing country, and the United States was greater than 6 cents per pound, or greater than the duty of 4 cents plus the maximum increase permissible under section 315. On May 19 the President issued a proclamation increasing the duty on that product from 4 cents to 6 cents per pound, the duty becoming effective 30 days after the date of proclamation.

On Nov. 6, 1924, the commission submitted its report to the President on barbital, or diethylbarbituric acid, and its derivatives. This report showed that the difference in costs of production in the United States and in Switzerland, the principal competing country, could not be equalized by increasing the present duty of 25 per cent ad valorem by 50 per cent thereof, the maximum allowable under section 315(*a*), and in order to equalize the difference in costs of production it would be necessary to change the basis of assessment of the 25 per cent duty from foreign value to the "American selling price" of the domestic product. On Nov. 14, 1924, the President issued a proclamation changing the basis of assessment of duty from foreign value to American selling price. The proclamation stated, however, that the duty should be based upon the American selling price of the products when sold under their descriptive names, barbital or barbital sodium, or under their chemical names, and should not be based upon the American selling price of the products sold under the trademark name "Veronal" or "Veronal Sodium."

On Dec. 29, acting upon a unanimous report of the Tariff Commission, the President advanced the duty on oxalic acid from 4 cents per pound named in paragraph 1 of the tariff act of 1922 to 6 cents per pound. The differences in costs of production in the United States and in Germany, the principal competing country, were found to be greater than the present duty of 4 cents per pound and slightly greater than the maximum duty permissible under section 315. The increased duty will become effective 30 days after the proclamation.

Investigations, including public hearings, completed during the early part of 1924, related to cresylic acid, phenol and linseed oil. The outstanding investigation of the commission in connection with chemical products during 1924 is that of vegetable oils.

On Feb. 8, 1924, the commission instituted an investigation of the following oils and fats: "Herring, menhaden and whale oils, and all fish oils not specially provided for (par. 52); olive oil (par. 54); coconut, cottonseed, peanut and soya-bean oils (par. 55); tallow, oleo oil and oleostearine (par. 701); . . ."

On this same date a preliminary public hearing was ordered for March 7, 1924, at which all interested parties were requested to submit evidence "with respect to the industrial effects of the duties imposed upon said articles respectively; the competitive conditions under which said articles are produced, imported or marketed; the interchangeability in use of said articles; the relation between the raw materials subject to said duties and the finished or partly finished products derived therefrom; the differences in the conditions of production; advantages and disadvantages with respect to competition in said articles; and particularly with respect to related articles, the articles proper to be included in said investigation, and such other matters as will tend to facilitate the conduct thereof."

After consideration of the information developed at this preliminary hearing the commission, on May 29, 1924, approved a plan of investigation on oils and fats which embraces cost investigations for the purposes of section 315 on coconut oil, soya-bean oil, peanut oil, cottonseed oil, and also an economic study of the interrelation of all important oils and fats, with particular emphasis on those used chiefly for commercial purposes; of the prices of oil-bearing materials and the relation of prices of these materials to the finished products (oil and oil cake) produced therefrom; and of the problems of marketing, handling and transportation of vegetable oils.

Foreign Investigation. In accordance with the plan outlined above, a field crew consisting of two chemists and two accountants left the United States during the latter part of June to obtain production costs and other relevant data on crushing cottonseed in England, the production of coconut oil in Holland and the crushing of peanuts in France. The investigation in these countries was completed during September, and representatives of the commission were successful in obtaining production costs of the respective oils in the countries named. Two members of this crew then proceeded to British India, Ceylon, Dutch East Indies and the Philippine Islands to investigate the costs of production of coconut oil in those important producing centers. Valuable data on the industry in these countries have been obtained by the commission's investigators, who have only recently returned to this country.

Early in the month of July a field crew consisting of one chemist, one economist and one accountant left the United States for the Far East to obtain production costs and other relevant data concerning the crushing of soya beans in Japan and Manchuria and the crushing of peanuts and cottonseed in China. Production costs and other economic data were also obtained in each of these countries.

Domestic Investigation. The domestic investigation of these oils involved obtaining costs of crushing cottonseed, which is produced throughout the Southern States; of crushing peanuts, largely centered in Virginia, North Carolina and South Carolina; of the production of coconut oil, largely centered on the Atlantic and Pacific coasts; of the crushing of soya beans, which is localized in Indiana and Illinois, and of the refining of the various oils and fats, which is distributed widely throughout the United States.

To secure production costs in the Southern States, three crews consisting of four men each (one chemist, two accountants and a tabulator) were sent into the field during the latter part of July, after cost schedules which had been approved by the commission had been mailed to manufacturers of these products. One crew covered the states of Texas and Oklahoma; another Louisiana, Mississippi, Alabama, Arkansas and Tennessee, and the third crew the States of Georgia, North Carolina, South Carolina and Virginia. A fourth crew, consisting of one chemist and one accountant, was sent into the field during the early part of August to obtain production costs of coconut oil, soya-bean oil, and the costs of refining vegetable oils in the Atlantic coast, Middle West and Pacific coast districts.

In order to carry out the economic study outlined above, schedules for production costs also called for data in regard to average prices paid for raw materials and average prices received for finished products for the fiscal years 1924 and 1919 to 1924, inclusive. Questionnaires were sent to important dealers and brokers in vegetable oils to determine the market price of crude and refined oils, and also to manufacturers of soap, lard substitutes and salad oils and mayonnaise dressings, to determine the consumption of the various oils in these industries for the calendar years 1921 to 1923, inclusive. The object was to determine, if possible, the change in consumption of each oil and what effect the tariff may have had on the use of specific oils in the various consuming industries.

The domestic and foreign field work in connection with the vegetable oils investigation was completed during the latter part of 1924. These data are being tabulated and compared, so that a preliminary summary of the data obtained may be issued to interested persons prior to a public hearing in connection with this investigation.

Dyes and Other Coal-Tar Products

During 1924 the commission completed a detailed census of dyes and other synthetic organic chemicals covering the calendar year 1923. This is the seventh annual report that the commission has made on the progress of the domestic dye industry. Plans have been made by the commission to compile a similar report covering the year 1924.

Reduction of ad Valorem Duty. The ad valorem duty on dyes and finished coal-tar products was reduced in accordance with the provisions of paragraph 28 of the tariff act of 1922, on Sept. 22, 1924, from 60 per cent to 45 per cent ad valorem. The specific duty of 7 cents per pound remained unchanged. This reduction in duty has the most significance in connection with the higher priced dyes, since the ad valorem duty is the most effective on that class of dyes, whereas the specific duty has relatively less effect on this class of colors and becomes more effective as the price of the dye declines. It is not likely that the reduction will have a marked effect upon the cheaper priced dyes, which represent the major portion of domestic production. However, it may have some tendency to retard the development of new products, since the dyes needed to round out the list of domestic colors are the higher priced dyes used for special purposes and for which there is a comparatively limited demand.

Our Foreign Trade in Chemicals

World Conditions Emphasize Need for More Efficient and Intensive Cultivation of Export Markets

By Julius Klein

Director, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C.

DURING the past year there has been no significant development of outstanding consequence, either at home or abroad, which has shown any great effect upon our foreign trade. Yet the stabilization of conditions in Europe is bound to be felt, and while it is still too early to forecast this trend with any degree of accuracy, it is certain that much keener competition will be experienced. Consequently more efficient and intensive cultivation of foreign trade must continue to be the thought of the American exporter.

For many worthy reasons the stabilization of Germany is very much to be desired. Our chemical manufacturers should realize that with an improved condition in Germany there will naturally arise a more intense competition in the world's chemical markets. Efforts on the part of Germany to arrange for the financing of chemical operations are meeting with more and more success, but even in this instance there is some Balm in Gilead for the American industry, for operating costs in Germany are rising and consequently the prices at which German products may be offered should not be at the ridiculously low figures of some time past. Increasing efficiency on the part of our own manufacturers is serving to equalize the prices of chemicals in this country and abroad, and on this score alone there should be no great cause for worry in considering any general field of chemical lines in which America and Germany are competitors. There is, however, one phase that is distinct from a mere price situation, and that has to do with the attitude of our foreign competitors, in that the Germans are imbued with the intensive determination to regain such markets as have been lost and to re-establish their former position in world trade.

Competition on the part of England, France, Italy and Japan has been successfully met during the past year, and on the whole we have maintained our established position in world trade. To some extent we have even extended it, particularly in entering new markets, and are now exporting commodities that did not formerly enter into our export trade. The year 1925 should see no change in this general condition, but the competition by Germany continues to be the great unknown quantity, difficult to foretell but important enough to warrant careful study.

In discussing foreign trade it is necessary to depend very largely upon statistics, and it is felt that the figures as they appear in the following discussion are sufficiently clear to indicate the volume of our chemical export trade, its concentration or lack of it in various markets of the world, and the general healthy condition of our trade through comparison with previous periods.

The exports of chemicals and allied products for the 10 months ended Oct. 31, 1924, had an aggregate value of more than $115,000,000, and although 8 per cent under the corresponding period of 1923, were well above (35 per cent) the same period of 1922. The year did not see the high figures reached during the months of March to July, 1923, and then the decline in the fall and winter months, but it has shown a more even tone, with the month of October, 1924, the peak of the year, conspicuous for the size of its shipments. At the time of writing details for countries are not available for a period other than the 9 months. An examination of the country sheets for the 9 months of 1924, for some of the leading commodities of the chemical group, discloses no marked changes from 1923.

Briefly, Canada was the largest buyer of American chemicals, while practically all the Central American countries, West Indies and some of the larger South American countries purchased some chemicals, if only small amounts, from the United States. Eliminating toilet preparations, which were sold throughout the world with one or two minor exceptions, the United States has not shared to any extent in the demand for chemicals from African countries. In the Far East, Japan stood out as an important outlet, with China, British India and Australia also buyers of American chemicals, while the Philippine Islands naturally procured the largest portion of their consumption from the United States.

Although the quantities of sulphur exported during the first 10 months of 1924, amounting to 413,000 tons, were 20,000 tons less than in the first 10 months of 1923, the values, amounting to $6,645,000, were $135,000 in excess of the 1923 values. Canada, with 28 per cent of the total, imported the most. Comparing the countries of destination for the 9 months of 1923 and 1924, France and Germany, the other leading countries, took

a little less this year than last, while the Netherlands was prominent for its decided increase from 4,500 tons in 1923 to 17,300 tons in 1924.

The exports of industrial chemicals, which group accounted for 17 per cent of the total, was $2,500,000 less than for the first 10 months of 1923. This falling off in exports was partly due to the increased domestic demand, with the result that manufacturers have not had the incentive to go after the foreign markets. Then, too, increased activity on the part of some of the foreign competitors, such as England and Germany, has undoubtedly obtained for them a part of the business formerly done by American concerns.

The exports of sodas and sodium compounds (260,000,000 lb., valued at $7,000,000), which made up approximately one-third of the total industrial chemical group, failed to reach the 1923 figure by 17 per cent. This important group of chemicals has continued to diminish during the past 3 years, probably on account of the increased domestic demand and the greater competition in foreign markets from England and Germany.

Caustic soda comprised one-third of the group and showed a drop of 17 per cent during the 10 months of 1924 as compared with 1923. A study of the country sheets disclosed a rather constant demand in certain countries, steady shipments having been made month by month to Central and South American countries, China, Netherlands East Indies, Philippine Islands, Australia and British South Africa. Mexico was the most important outlet during the first 9 months of 1924 and shipments surpassed those for the entire 12 months of 1923. Japan's purchases during the current year have been falling off considerably, while sales to Germany also showed a big reduction.

Coal-Tar Chemical Decline

Exports of coal-tar chemicals failed to reach the 1923 ten-month figure by 11 per cent, the total exports for the first 10 months of 1924 having equaled $8,804,000. Benzol and crude tar and pitch showed marked reductions. Coal-tar colors, dyes and stains declined less than 0.06 per cent in values shipped, although the quantities fell 12 per cent to 13,424,000 pounds.

China has been the largest buyer of goods of this type, and during the 9 months of 1924 received 8,100,000 lb., valued at $1,888,000, which compares very favorably with the total shipments made in 1923. Japan likewise has purchased more than last year, having taken so far more than 2,200,000 lb., valued at $1,109,000. On the other hand, Canada, British India, Argentina and Belgium have all taken less, while Mexico's allotment was about the same.

Fertilizers. Foreign sales of fertilizers and fertilizer materials during 1924 have been smaller than those of 1923. During the 10 months ended Oct. 31, 1924, 900,000 tons, valued at $13,900,000, was sent to foreign countries, 25 per cent less than amounts shipped during the corresponding period of 1923.

The decline of 40 per cent in value of exports of ammonium sulphate—which accounted for nearly one-half the total shipments of the group—during the 10 months of 1924 as compared with the 10 months of 1923, was partly offset by the increase in shipments of superphosphates and prepared fertilizer mixtures. Whereas the Dutch East Indies purchased nearly three times as much ammonium sulphate in the first 9 months of 1924 as in 1923, or a total of 28,000 tons, valued at $1,631,000, Japan, which was the principal factor in 1923, took less than one-third as much, or only $1,466,000 (24,000 tons) in the current 9 months as in the corresponding period of 1923. While sales to both Cuba and the Philippine Islands were larger this year than last, those to Hongkong diminished from $850,000 (10,000 tons) in January-September, 1923, to $90,000 (1,300 tons) in January-September, 1924. The distribution of ammonium sulphate was confined to a few countries.

Paints and Varnishes. Foreign sales of pigments, paints and varnishes did not come up to the expectations of American exporters during 1924. For the 10 months of 1924, exports valued at $11,850,000 registered a 15 per cent reduction from the corresponding period of 1923. The only commodities that gained in values were ready-mixed paints other than enamel paints, and oil varnishes.

Naval Stores. Exports of naval stores, gums and resins, the largest group of the chemical and allied products, recorded a 1 per cent loss as compared with the first 10 months of 1923, the total exports for the period under discussion having equaled $21,559,000. So far this year there was not much change from last year. The five countries, United Kingdom, with 35 per cent; Germany, with 25 per cent; Argentina, with 11 per cent; Brazil, with 9 per cent, and Japan, with 8 per cent, purchased 88 per cent of the total shipments of rosin during the first 9 months of 1924, which compared favorably with 1923.

Although the quantities of spirits of turpentine shipped in the first 10 months of 1924 were but slightly less than those of 1923, the values were 20 per cent less. During the first 9 months of 1924 the United Kingdom purchased 57 per cent of the total and the balance was distributed among many countries, with Canada and Germany each having taken 8 per cent.

The values of shipments of wood turpentine and turpentine substitutes during 1924 were slightly more than in 1923, although the quantities shipped were considerably larger. Wood turpentine was exported to a great many countries, with the largest country, Canada, having received only one-quarter of the total shipments during the 9 months of 1924, or 107,000 gal., valued at $88,000. Germany was conspicuous for having procured more than seven times as much during the first 6 months of 1924 as that country did during the 12 months of 1923, but no shipments were made in the third quarter of the year. Both the Netherlands and England showed large gains during the 9 months of 1924 as compared with the entire year of 1923, while Argentina, Italy and Australia received considerably less.

Explosives. Smaller shipments of explosives to foreign countries throughout 1924 characterized the trade in this group, which is, however, one of lesser importance, having accounted for only 2 per cent of the total. All the items of this group with the exception of blasting powder and the "all other" class diminished. Dynamite, representing three-quarters of the group total, dropped 11 per cent in values shipped to the few countries buying this item. With the exception of one small shipment to the Philippine Islands, the entire market was found in Central and South America, with Mexico the leading country, having taken one-half the total, and appreciable amounts having gone to Peru, Chile and Cuba.

Technical Progress of the Year

Editorial Staff Review

WHAT have the technologists done during the past year in the chemical engineering industries? An attempt has been made to answer the above question in this section of the Review Number. Technology, of course, knows no fiscal year and a development may be recorded in 1924 that was begun years ago. Conversely much of the work of 1924 is still being continued behind closed doors and will not be known for some time. Yet with all the variables a review reflects accurately the progress of an industry and its technical vigor. No amount of closed doors can prevent the world from judging—by the quality of the product, by the kind and quantity of raw materials, by the intelligence and initiative of the technical man—and judging with fair accuracy the status of its technology. And fortunately for themselves and for the industries, manufacturing plants are coming more and more to realize the silliness of secrecy. No one in his senses would ask for or give information vital to the success of an enterprise—a real trade secret. That is one reason why so little is available on fine chemicals, for here the process is vital—a great capital asset. But for 95 per cent of the industrial plants in the chemical engineering industries, no secrecy is necessary. Better operating practices invariably exist somewhere in the industry. This is no idle talk. The doubter can see for himself if he will take the trouble to investigate.

For the most part the co-operation of prominent leaders in the industry has been gratifying and *Chem. & Met.* takes this opportunity of expressing its deep appreciation to more than a hundred technical men and executives whose generous expenditure of time and energy have made this review authoritative and accurate. May it prove an inspiration to greater achievements in 1925!

An Industry Studies Fundamentals

Developments in the Petroleum Industry Follow This Line

THE SPIRIT of the petroleum industry is well examplified by the American Petroleum Institute meeting at Fort Worth, Tex. It is a spirit that permeates not only research and technology but the business policies of the industry. It is a spirit that will not tolerate a superficial or haphazard survey of the conditions facing the industry, but demands a study of fundamentals upon which to build a sound development.

This has led to investigations in research dealing with the mechanism of basic reactions. The chemistry of the refining processes has been studied, as, for example, the reactions involved when various refining agents are used in the removal of sulphur. This same spirit has brought engineers into the industry to study combustion and heat transfer, two of the most important and fundamental problems in petroleum refining. It has led to an investigation of fractional distillation that has already yielded remarkable results. There is a wider use of fractionating columns and they have been applied to fractions heavier than the ordinary naphtha fraction. This has resulted in better yields and better quality of products than can be obtained from ordinary equipment. Almost every company is developing towers and overhead equipment along its own ideas, but it is invariably better than earlier equipment.

Vacuum distillation has been revived after almost 50 years of coma and applied to the distillation of bright lubricants from low-grade crude oils. The pressures in this work are unusually low, amounting to less than 1 in. of mercury.

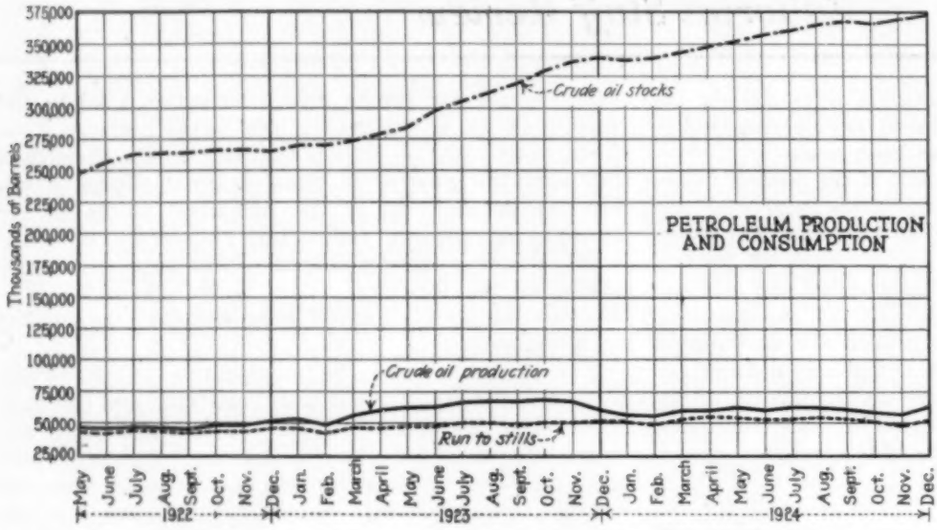
Naturally no report of petroleum progress would be complete without a mention of the cracking processes. Considerable advance is reported and relatively great activity in installing new plants, especially those of the coil type of construction. This activity exists in spite of the great overproduction of crude oil, which would naturally have a tendency to slow down progress.

Several important developments have been recorded in the field of gasoline refining. Perhaps the most interesting one is the refining of gasoline in the vapor phase by means of fullers earth. This is interesting both theoretically and practically. It represents a type of process that is likely to be found increasingly during the next decade not only in petroleum refining but in many other industries. And specifically this process seems to have many advantages that are encouraging. The use of hypochlorites has been further studied during the past year and it is understood that commercial developments are under way on a large scale. Silica gel as a refining agent seems to have found a home in one of the plants of the Shell company, but no details of its success have come to light up to the present time. The so-called contact process for filtering lubricating oil reached large commercial proportions during 1924, particularly in the far Western refineries. California bentonite or montmorillonite — with or without acid treatment—has been found to give remarkable decolorizing efficiency—in fact, tests have shown for this material a refining capacity as much as sixteen times that of ordinary fullers earth.

Photo by Ewing Galloway.
Three Future Captains of Industry

During the past year there has

Technical Progress of the Year



A Hoped-For Reduction

For the first time since 1906 it looks as if there were a decrease in the annual output of crude petroleum in the United States. The Geological Survey estimated that 710,000,000 bbl. was transported from the field, and allowing 7,000,000 for fuel consumption and changes in stock, there is an indicated total of 717,000,000 bbl. This is a decrease of 15,000,000 bbl., or 2 per cent, compared with 1923.

been considerable agitation in connection with various dopes for gasoline. The net result has been to put the quietus on several well-advertised but practically useless products. The work by the Bureau of Standards shows that no real dope has been produced that gives an improvement in power or fuel consumption if there has been no detonation when operating with untreated gasoline. It is also true that dopes that are beneficial derive their value from the effect on detonation. Quite apart from these useless materials has been the development of tetra-ethyl lead in commercial quantity as a result of the pioneer work of the General Motors Corporation. From the industry's viewpoint the significant point is that if vaporization and distribution of air-fuel mixtures can be improved somewhat, these anti-knock compounds will permit a still deeper cut into the kerosene fraction. This will naturally result in an increase in the available supply of motor fuel.

Nor would a review of the year be complete without mention of the revival of technical interest in oil shale. Fundamental engineering knowledge has been accumulated in the government and university laboratories, in the research departments of a few far-seeing oil companies and in the actual experience of several bona-fide organizations sincerely interested in oil-shale development. There is a growing realization that when the time comes for actual utilization of oil shale, the development must be carried on by the engineers of the petroleum industry.

Paper Industry Has Economic Vision

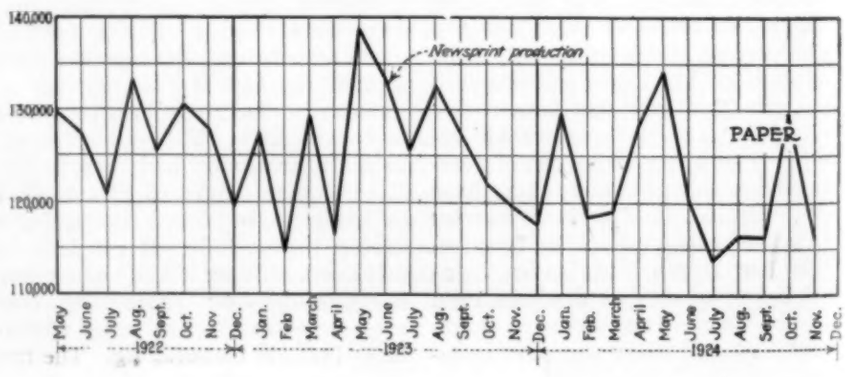
The Effects of Policies Outlined Last Year Will Be Fundamental

THE CHEMICAL ENGINEER who stops to consider the advances that his profession is making will undoubtedly be enthusiastic about the pulp and paper industry, for here the technology of the unit processes has made notable progress. In this industry chemical engineering has gone through that pioneer stage that is so discouraging. It is recognized and accepted. It is therefore gratifying to find the paper industry on the move, alive and progressive.

During 1924 there were two important principles laid down that will have a far-reaching effect on the industry and its future. They could not have occurred except in an industry that was alive not only technically but economically. The first of these was the Clark-McNary bill designed to bring the government and the industry into closer co-operation for the protection of our forest reserve. The constructive part which the industry played in backing this bill reveals a keen appreciation on its part of the necessity of a national policy on forests in order to secure a permanent supply of pulp wood. That spells the difference between economic statesmanship and economic profligacy.

The second fundamental principle is the advisory committee of the pulp and paper industry formed in conjunction with the Department of Agriculture. This is a substantial beginning of a close co-operation between government and industry on matters of research, manufacturing processes and economics.

The technical progress of the industry lies along two general lines. One is waste elimination and the other is machine or process improvement. Bark has always been a waste product and progress in developing its efficient burning constitutes a


140,000
130,000
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Newsprint production
PAPER
May June July Aug. Sept. Oct. Nov Dec. Jan. Feb March April May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. March April May June July Aug. Sept. Oct. Nov. Dec.
1922
1923
1924

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considerable item. Large losses of wood fiber have always occurred in the water running to the sewer in both pulp and paper plants. An increased interest in salvaging this material has been apparent through the use of various sedimentation methods. Another heavy loss has been avoided in preventing the decay of ground wood pulp by a cymene-naphthalene mixture at a cost that will not exceed $1 per ton. This enables mills to store the material for 6 months or a year if necessary.

In a recent issue of *Chem. & Met.* an abstract of the remarkable work done at Cloquet, Minn., was published. Here there is a decided effort to assemble complementary industries at one spot. Lumber, paper of various kinds utilizing woods not normally utilized in making high-grade paper; artificial board, a synthetic product made from the waste of the lumber and paper mills, and balsam wool, an insulating material from another waste product, are included in the list of marketable commodities now produced.

Among the strictly technical developments are the Keebra process at Cloquet, which makes high-grade book paper from aspen; the Decker cooking system for sulphite pulp, which uses less steam than other processes; thick bleaching of pulp, which effects a saving in the preparation of wood, the amount and time of bleach and in addition improves the color of the product; the increased use of continuous filters, particularly on alkaline processes. These are some of the advances.

There is a report current that the American rights of the DeVains chlorination process for making pulp from straw have been purchased and that development is under way. It is not unreasonable to expect that the wheat straw which is now burned on the Western prairies may find its way at least in part into paper. But that is a few years off at best.

Several other adjuncts to paper plants have become more widely used during the past year. The electric steam boiler is one. (Perhaps it should not be called an adjunct of a paper plant, but the truth is that paper plants are usually better fitted to adopt this piece of equipment than almost any other plant. This because of the economics of location and power conditions.) The other is the Briner economizer, which heats the ventilating air by means of the vapor from the paper machine.

Rubber Industry Continues Research

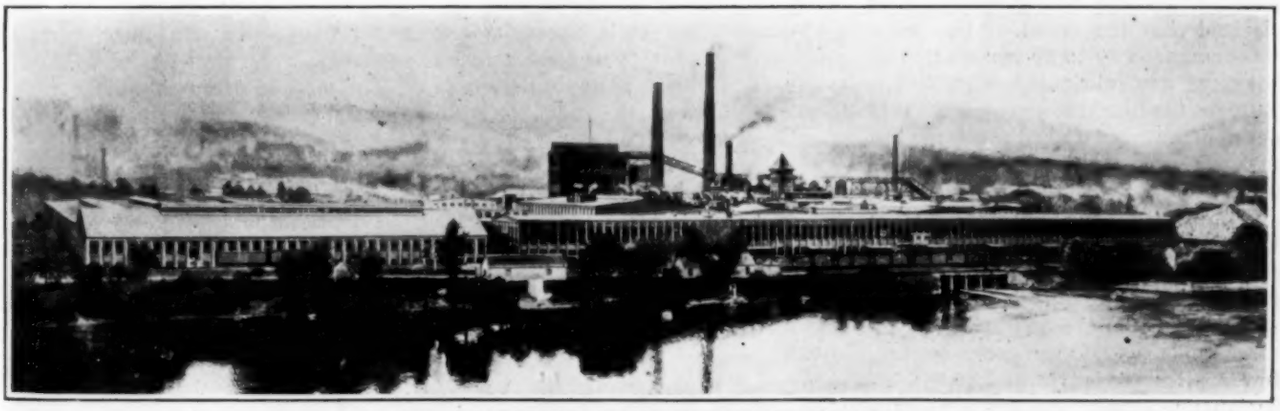
Research and Technology Have Both Made Notable Progress During the Year

THE RUBBER INDUSTRY was the original hero of the rocky road to Dublin, for economically it fared unusually badly during the 1921 depression. It will be remembered that the situation was serious enough to warrant an investigation of the sources of raw materials by the Department of Commerce in order to determine the desirability of developing an American supply. Through all of its tribulations, however, the industry has persisted in a research program that has borne constructive results and 1924 brought forth its full share of them. They may be divided into several groups for convenience. The first group comprises those that are primarily of scientific and theoretical interest at the present time. Many of them promise industrial developments of some magnitude, however, and are decidedly appropriate in a discussion of the technical progress of the industry. Careful work has been done on the chemical composition of caoutchouc. It was approached from the determination of molecular weights of hydrogenated caoutchouc by the depression in freezing point of camphor. Conclusions indicate a formula for rubber corresponding to $(C_5H_8)_{10}$.

Another research deals with the microscopy of latex and the structure of the individual particles of rubber. Their behavior during vulcanization and coagulation was also observed.

The brilliant work of many workers on accelerators that permit the low-temperature vulcanization of rubber has continued and has had results in factory operation through lower temperature in the vulcanization of tires. It is generally believed that this will result in the improvement of the finished product.

Turning to the second group of advances that have more direct bearing on the manufacture and on the resulting product, the increased use of continuous material handling in rubber factories should be mentioned as an important tendency. This has been especially true of the larger companies, where the volume of production would naturally show a greater return on a heavy investment in such equipment. The long-distance trans-



A Mammoth Mill—the Oxford Paper Co., Rumford, Me.

Technical Progress of the Year

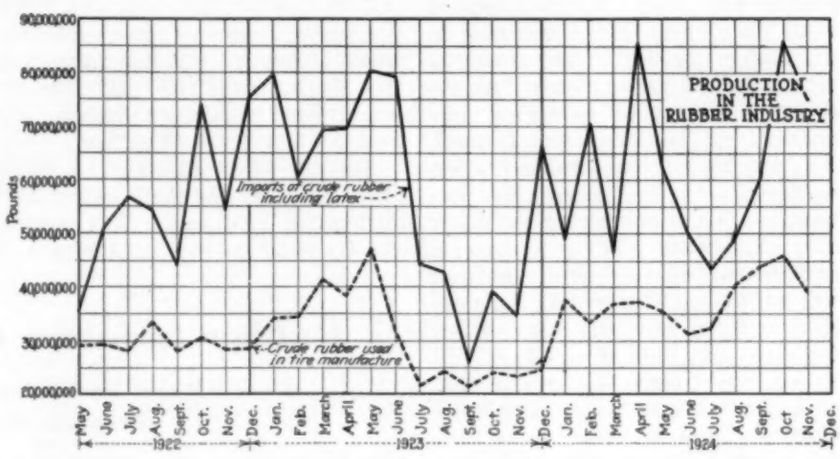
mission of power is reported by leaders in the industry to have a desirable effect on the uniformity of electrical power, particularly at the Ohio factories.

The use of latex still continues to be the most dramatic development in the rubber field. The economical handling and shipping of this material has received the attention of many technologists. This was to be expected, as the water content of latex is extremely high. Processes have been developed for the concentration of latex to any desired point. It can be shipped as a concentrated paste with a consistency of cream cheese—in fact, it can be concentrated to a point of freedom from water, when it is in the form of a dry powder. These pastes and powders are completely reversible with water and it would seem as though the objection to latex on the score of the cost of transportation is no longer valid.

Some of the recently developed uses for rubber are worth mentioning—for example, paving. It is not strictly a new idea, but a large experimental pavement laid in Whitehall, London, has called attention again to the possibility. There is no doubt that a durable pavement for rubber has been laid, but whether it will be enough better to warrant the additional cost is another matter. A commercial possibility is the use of rubber blocks at street intersections as traffic signals. Blocks of colored rubber can be set in a matrix of black blocks, and will save all the cost of painting the signals, such as "STOP," on the roads.

Rubber bearings seem rather odd at first, but they have been used successfully on motor boats, and larger experiments are under way. It is claimed that the speed of the boats was increased 10 to 20 per cent. The bearings are lubricated with water. Rubber-lined tanks are not a 1924 development, but they have been improved, and rubber has also been used with success on ball mills.

No story of the rubber industry would be complete without an account of the balloon tire. This is so well known that it is hardly necessary to mention the outstanding features such as larger cross-section, fewer plies of fabric and lower inflation pressure. The greater cushioning action may permit lighter frame construction of the car and hence more mileage per gallon of fuel. The tire mileage is as yet an unproved quantity, with statistics on both sides of the question.



Supplying the Sweet Tooth of the Nation

The Sugar Industry, a Model of Efficiency, Decides to Help Mother Nature Make More Sugar

A COMPOSITE letter from leaders in the sugar industry would certainly read, "There have been no outstanding developments during 1924." This is not surprising from either a chemical or an engineering standpoint, because the sugar industry was already extremely efficient. Improvements might be expected in minor details rather than in major processes.

One of the most unusual phases of the sugar industry is the establishment of sugar experimenting stations and courses in sugar technology in many parts of the world. There is also a decided tendency to increase the number of agricultural experts devoting their attention to sugar. Many large estates now employ an agricultural expert whose main job is increasing the yield of cane, for "you cannot make sugar in a sugar house unless you first grow it in the field." And, therefore, no matter how efficient the sugar house and refinery are, they might get a very poor start with either a low sugar-bearing cane or a low yield of cane per acre. Part of the task will undoubtedly be the restoration of cane land to its original fertility.

With regard to the actual technology of sugar itself, the use of vegetable char is a significant development of the year. It has not displaced bone char and it is not likely that it will, for the variety of refinery products cannot be made with vegetable char alone. On the other hand, it is undoubtedly true that some localities and certain conditions will make it possible to produce standard granulated sugar by means of vegetable char more cheaply than by standard refinery conditions at the present time. The multiple crushing of cane seems to have proved its worth, and two crushers followed by twelve rollers will in all probability prove to be standard equipment. The Dorr thickener is another piece of equipment that has become firmly established in the sugar industry and the Petree-Dorr process for raw sugar production continues to make progress.

The method of cutting cane in the fields is being examined and studied for improvement. There is no mechanical harvester yet, but the Luce harvester is said to be promising. Certainly the day must come, and soon, when hand cutting of cane will have to be eliminated. Still another phase of cane process is beginning to receive attention and will have to receive more attention in the future. This is the cane diseases, which are creeping into cane coun-

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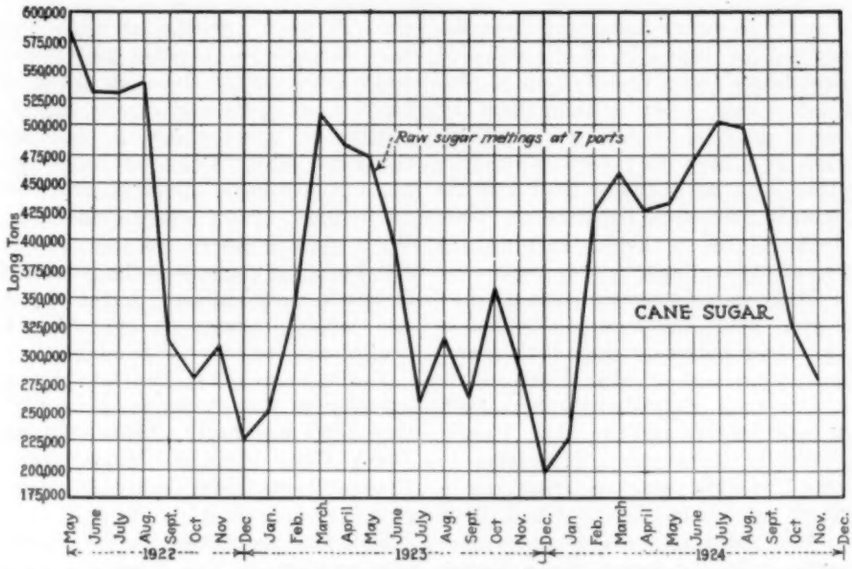

tries and must be fought with high type of scientific skill.

Another phase of cane sugar work is the disposal of byproducts, one of which is the utilization of bagasse, in the production of a product called Celotex—a thick board satisfactory as a building material. This development has given Louisiana planters more for their bagasse than they used to get out of it as fuel. The tendency for electrification in the sugar industry continues, and will undoubtedly go on. Many new sugar houses are electrifying everything except the mills, and in some cases even the mills are electrified.

Less can be said with regard to developments in the beet-sugar industry, for as one prominent manufacturer said, "One of the largest plants, for example, has had better than 97 per cent extraction for a period of 6 years." This means that unknown losses are practically nil and that the known losses are unavoidable and unprofitable from a commercial standpoint. There has been a tendency in beet sugar mills, during the past 6 years, to get away from the plate-and-frame press and to adopt a combination of thickener and continuous rotary filter. The Dorr thickener has made considerable progress and some experiments have been carried out with the Genter thickener or filter on certain combination uses. Another interesting tendency in the last 2 or 3 years has been toward the better mechanical handling of beets at points where they must be transferred from one method of shipment to another, or unloaded at the factory. This has brought about considerable saving. Finally, considerable work has been done on beet sugar residues and already betaine and glutaminic acid have been prepared in commercial quantities by a satisfactory process. The same kind of recovery also yields a potash salt that bids fair to become a stable factor in the American potash market within the next decade as soon as a market can be found for the other products to help carry the expense of production.

In the related industries there are things worthy of note, one of which is the commercial preparation of dextrose, and another, although not strictly a 1924 development, is the production of the sorghum sirup industry at one plant on a sound commercial and engineering basis.

One of the Colorado Plants of the Great Western Sugar Co.

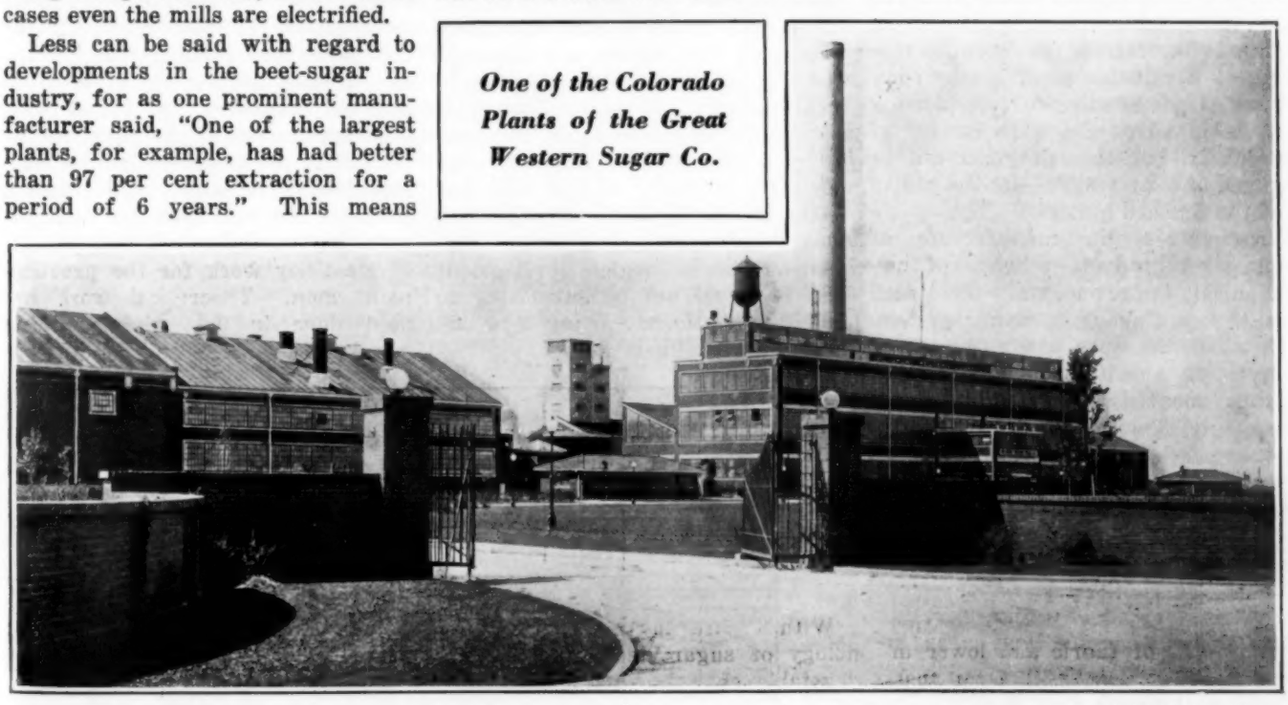

Photo by Ewing Galloway

Ceramics Developments

A Glimpse of the Progress of the Refractory, Enamel and Glass Industries

THE FIELD of ceramics is sufficiently diverse to make possible a whole page devoted to the mere naming of the various branches. Manifestly it is then impossible to do more than mention one or two

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high spots in the special branches that particularly interest chemical engineers.

Refractories will receive considerable attention during the year to come in *Chem. & Met.*, as there is an ever-increasing appreciation of the importance of these materials. They are no longer simply firebrick to be purchased in bulk without specification and on price alone. There is usually too much at stake to look with complacence on refractory failure. The loss of production and the cost of replacement are items that can no longer be disregarded in the keen competition of today. The consciousness to this situation has awakened notably during the past year.

A number of engineering improvements have been completed or well begun in the production of refractories. Such a thing as the tunnel kiln for firebrick was unknown not long ago, but at the present time there are several units in the course of operation or construction. Attention is being given to grinding, mixing, drying and calcining both by producers and even by consumers of refractories. This work is largely engineering in its nature, and that too marks a notable tendency in the industry.

Enamels are and presumably will remain a mysterious secret in so far as their composition is concerned. This is natural, for the formulas represent a valuable asset to any company. Undoubtedly progress is being made in all of the wide variety of products, but this progress can be gaged only by results—by the utility of the finished material. The visible progress in the manufacture of enameled products consists of mechanical improvements. One such is the continuous spraying system, in which the ware passes through a booth on a belt or cable conveyor, being sprayed in transit. The advantages of quick drying of sprayed materials both as regards saving in floor space and elimination of dust contamination have led to the introduction of drying chambers and, in some cases, of continuous driers in enameling plants.

The furnaces or ovens, for they are almost all muffle type ovens, are being constantly improved, whether fired by gas, oil, coal or electricity. Muffleless furnaces and continuous electric furnaces have both been described in 1924. A diminution of heat losses and a speeding up of production has been accomplished by using dual loading forks, in which case one fork is loaded while the other is being burned. This and the tendency to burn flatware at lower temperatures to avoid warping are recent innovations.

Glass manufacturers have not had a good year, and this has tended to produce a better product both chemically and mechanically. Particularly is this true of food containers such as milk bottles and the like. Parenthetically it may be of interest to note that this pleasure-loving age in which we live has brought bad times to the manufacturers of glass preserve jars for home use. People nowadays would apparently rather ride in automobiles than can fruit. However, the old adage regarding the "ill wind" holds, for while the manufacturer of pressed and blown ware loses, the producer of polished plate glass gains and it was the incentive of greater output that led the Ford Motor Co. to develop and place in successful operation the first continuous plate glass machines. With plate glass of greater widths for building purposes, the problem is much more difficult, but at least one large producer is operating a continuous commercial machine.

For window glass, the continuous drawing of flat sheets has been further developed by the Libbey-Owens Sheet Glass Co. and twenty-four Fourcault machines have also been placed in operation.

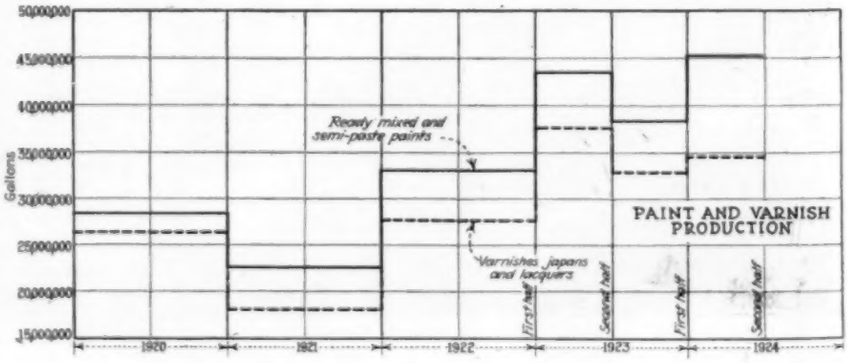
Refractories continue to be a serious problem in the glass industry and experiments in water-cooling tank blocks are being watched with great interest.

A Notable Year in the Paint Industry

Good Business, New Pigments, New Varnishes, Research, All Contribute

THE PAINT AND VARNISH business of 1924 has been good. The manufacturers have been successful and in a year when many industries were depressed it is a relief to have an optimistic report. In general, it can be said that there have been no revolutionary changes, but that is true of almost any technical industry. There has been little change in the processes of manufacturing during the past year, although one thing is worthy of note, and that is the increasing interest in the ball mill as a means of grinding pigments. This is a logical development and it would not be surprising to find a revolutionary swing to a ball mill within the next decade.

There has been a great deal of fundamental study on the properties of materials that enter paints and varnishes and upon the testing of these materials and the finished products. There has been also a notable development of new materials for the paint and varnish field. Plasticity, that latest magical word in physical chemistry, has found practical application to the paint industry among the larger companies with intelligent research departments. There is now vast need for an interpretation of the interesting results of plasticity work for the practical paint man. Theoretical work has been done in determining hiding power of pigments and in develop-



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ing new methods for such determinations. Covering power of paints has received theoretical and practical study and the testing of paints by accelerated processes has yielded some promising results, results that may show a definite improvement in the longer life of paints.

Perhaps the most interesting developments are those that include the new materials. Among these should be mentioned new pigments with unusually good covering power together with other properties that make them interesting. Titanox, as the name implies, is titanium oxide, with which has been precipitated barium sulphate. New lithopone exterior paints have been developed and a pure white lead pigment called supersublimed white lead.

All these things show definitely the tendency toward improved raw materials and pigments for the paint industry and the tendency is extremely significant. It indicates greater technical penetration of the paint field and a willingness on the part of paint companies to invest in research. Among other things, there are several mineral priming paints that have been recently developed. One in this country containing 75 per cent zinc dust and 25 per cent zinc oxide and another one in Germany composed mostly of finely divided lead. Neither has the indorsement of a long industrial trial as yet.

One of the most outstanding developments of the year in the paint and varnish field has been the growing of tung trees in Florida. Up to the present time China has supplied 100 per cent of the world's requirements for tung oil, or chinawood oil, as it is familiarly known. This material has been of considerable value in recent years in paint work as a vehicle. A group of American paint men have started an extensive development of tung trees in Florida, where 270 acres of land has been cultivated and approximately 25,000 tung trees have been planted, and 10,000 additional seedlings were distributed to twenty-four farmers in that vicinity for their own property. On another tract of land there are between 18,000 and 20,000 2-year old seedlings.

This brings us to probably the most significant development in the field, the pyroxylin lacquer. Although some of those familiar with the industry have issued a word of caution and have felt that with characteristic American enthusiasm we have adopted pyroxylin lacquers before they have been thoroughly and satisfactorily tested, yet the general impression is that here is a real revolution in paint and varnish practice. Recent readers of *Chem. & Met.* are well acquainted with this development, which has been fully described in these columns. It remains only to remind them that pyroxylin lacquers are not new, but have been in the past so dilute that any appreciable layer of commercial value required a number of applications before it was satisfactory. More concentrated solutions were too viscous to permit the proper working. The extensive use of these lacquers has been due to the development of a concentrated solution which at the same time is fairly fluid. The increasing use of pyroxylin lacquers is astounding and for the most part people are confident that they will hold the advance they have made and keep on growing.

The Modern Cement Plant of the Manitowa Portland Cement Co.

Technology and Huge Expansion

The Cement Industry Contradicts the Belief That Rapid Expansion Inhibits Technical Progress

TO understand fully the progress made in the cement industry during 1924, it is really necessary to understand something of the background of the industry and the nature of its development. It is unquestionably a chemical engineering industry, for its manufacture consists of a number of unit processes operated under careful chemical control, and yet it is an industry in which the art developed away ahead of the science. Now little by little the science is trying to catch up, with the constant assistance of the leaders of the industry. From another point of view cement is a very recent industry. Its shipments for 1924 will be very close to 150,000,000 bbl., a 50 per cent increase over the 1920 shipments. This means that the pressure on equipment has been high, and inevitably there has been a tendency to push production beyond limit of the existing equipment. Consequently methods of increasing production have been discovered under this pressure. These two main divisions of progress can be discerned in most of the developments of 1924.

The Portland Cement Association has been carrying on research on its products for a long time, with highly successful results in the education of the consumers of portland cement. This last year marked a new epoch in cement research, for the Portland Cement Association, together with the United States Bureau of Standards, has outlined an extensive program of research. Take, for example, the extensive research on the composition of cement clinker made from pure compounds and from pure compounds with admixtures of im-

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purities, such as those found in natural materials. There will also be extensive studies of the characteristics of the raw materials from a petrographic standpoint. Finally, there will be work on hydration of cement and on the crystalloidal character and behavior of silicic acid. This research promises well and deserves mention in any review of the technical developments of the industry.

In four other respects has the portland cement field made notable progress during the past year. All of them are mechanical developments of an engineering nature. In grinding both raw materials and finished clinker the compartment ball mill has been used increasingly. Formerly the material was ground twice, either in two ball mills or in mills of different type. This necessitated an extra elevator and considerable conveying machinery, which is entirely eliminated by the use of the compartment pebble mill. This both granulates and pulverizes in one operation.

There is also a tendency in grinding materials to use larger units than were formerly employed. During the past 10 years opposing tendencies have been at work in connection with the rotary kilns. There has been a distinct leaning toward larger and larger units on the one hand, offset by a tendency to believe that the largest economical unit had been reached. This year seems to indicate that the tendency toward larger units is still predominant and kilns 11 or 12 ft. in diameter and 240 to 255 ft. long have been installed.

A development that is not strictly a development in the cement industry has benefited the industry markedly. This has been the improvement in high-grade refractory brick. Naturally the life of the lining of a cement kiln is a serious factor both in continuous operation and also in expense, for it costs a good deal of money to shut down a kiln to repair the lining or replace it, entirely aside from the loss that it entails in the production capacity of the kiln. Finally, the increasing use of waste-heat boilers is a subject of remark. More than forty portland cement plants are now operating on this equipment, thus utilizing the heat in the kiln exit gases to generate their power requirements. This is a distinct step in the direction of economy, and although the installations are expensive, they can show a handsome profit, even with a heavy depreciation charge.

There is still another phase of the cement industry that deserves mention. This is in the manufacture in America, for the first time during 1924, of the high-alumina cement. High-alumina cement has been used in France for a number of years in a commercial way, and has proved successful and interesting. It is not a competitor of portland cement, for although its time of setting is very much more rapid and it therefore presents many advantages in certain types of construction work, it is and always will be more expensive than portland cement and for much construction it is unnecessary to pay more than for portland cement, even though increased strength is obtained. For repairs on heavily trafficked highways, for submarine construction, for use in mines and for many other purposes, alumina cement will undoubtedly find a ready and extensive market here. Its arrival in commercial quantities on American markets is a milestone in the industry.

Better Use of Explosives

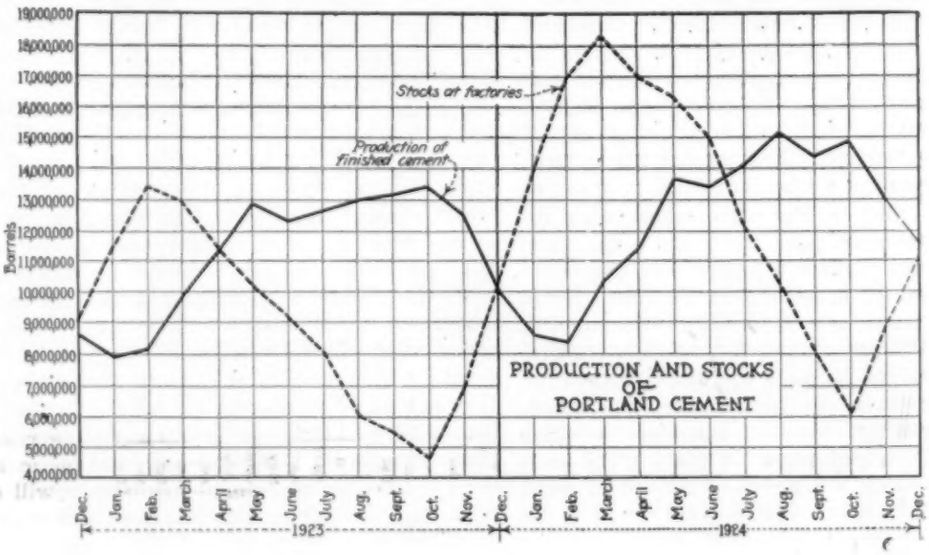
This Has Been the Natural Tendency of the Industry as a Result of Post-War Economies

IF WE DARED, we would say that explosives had gone up during the past year, but that is not the phase of the industry that we were planning to discuss. Not unnaturally there has been little tendency to develop new explosives or new methods of manufacture, but the year has been an interesting one. Much of the progress has been in the utilization of explosives, and some phases of this work will be of considerable value to the chemical engineering profession, as it has been commercially valuable to industry.

It can hardly be said that the industry is dying out. In 1923, the last statistics available, nearly 530 million pounds of explosives was produced. More than 60 million pounds of permissible explosives was used in the mining field during the same year, the largest quantity ever reported. The largest single order for explosives was placed on July 10, 1924, when 100 million pounds of pyrotol was contracted for. The largest single blast ever fired was touched off at Corona, Calif., in

Bigger Output of Cement

Although retaining its cyclic character because of seasonal demand, the production curve for portland cement climbed to new levels during 1924. It is estimated that the total production for 1924 reached 148,500,000 bbl., as against 137,406,250 bbl. in 1923. Total shipments last year were in the neighborhood of 150,000,000 bbl., as compared with 135,912,118 bbl. for 1923.



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April. All of these facts indicate health in the industry.

Some developments are worth noting—for example, the increasing use of TNT cordeau in blasting. This is essentially a copper tube packed with TNT and used as a detonating charge. It is especially useful in quarries, where it insures the detonation of a large number of holes without the possibility of failure due to the complicated wiring of a large number of electric blasting caps. The cordeau Bickford, as it is called, must be set up so that every branch takes off at exactly right angles, but this is not difficult and it is found to speed up the detonating wave through the mass of explosive so that greater efficiency is obtained. It has also made possible the use of black blasting powder where this was formerly impossible due to its slow burning. It is an unusual development that promises some saving in the cost of explosives.

Yet another development is worth mention, although it does not represent a permanent development in the art of the use of explosives. Quantities of smokeless powder were left after the war and the discovery of methods of using up these vast supplies constituted an economic problem of real magnitude. During the past year several new commercial explosives were developed which utilized pulverized smokeless powder as a constituent, and the problem is therefore solved. In fact, contracts have been made for cartridging 100,000,000 lb. of dynamite from this material for agricultural use.

Much more of a technical nature in explosives use could be written, but it would be more appropriate in a mine or quarry paper than in *Chem. & Met.*

To Be or Not to Be, That Is the Question

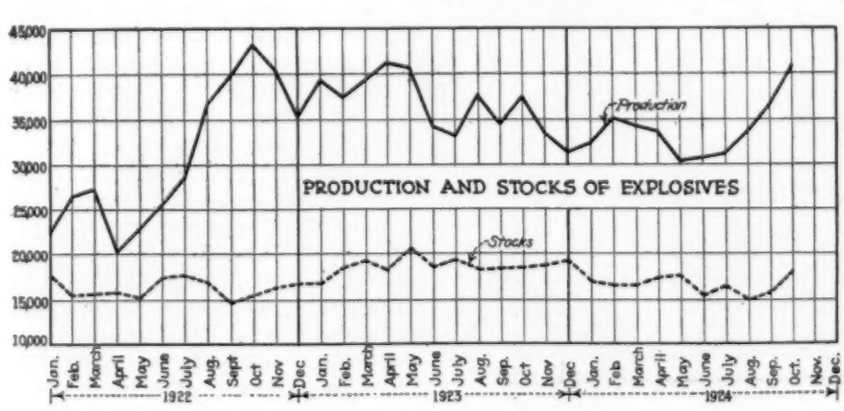
What Do the Technical Developments of the Fertilizer Industry Indicate That the Answer Will Be?

THE several spectacular failures in the fertilizer industry have tended to make technical men regard the industry as moribund and talk in hushed voices about it. Of course there isn't any doubt that the industry is hard hit and no one realizes this better than the technical men in the industry. It would be glib and superficial for anyone to attribute this condition to any single cause. It is not uncommon to hear the lack of research described as the root of all the trouble. This of course is not the sole reason, not with such trade practices as the sale of fertilizer on a basis of long-term credit and at a price " — per cent lower than any other quotation." This is not the place to analyze the faults and troubles of the industry, but one must realize its condition to appreciate the kind of developments that have taken place in and especially around the fertilizer industry during 1924.

Of the three ingredients of commercial fertilizer, phosphate, nitrogen and potash, the last named has seen but little change in the last 12 months. We still get 90.6 per cent of our potash from abroad, and although one or two hardy American companies still survive and probably will continue to do so, there seems little likelihood of developing an American potash industry that will stand the severe competition that exists today. With nitrogen and with phosphate the story is different and strangely parallel. Practically all of the phosphate is made from phosphate rock and is sold as acid phosphate. This is the old-line process and yields a product containing 16 per cent of available plant food.

Then comes the cry for commercial fertilizer having a higher concentration. The cry originated in the government and state agricultural departments. Gradually industry has taken it up and the result has been a definite tendency toward higher concentrations of plant food. But the possibility of getting cheap concentrated phosphoric acid in commercial quantities and at prices that would make it a definite competitor of acid phosphate did not seem to occur to the industry. Again the government pointed the way by investigating the possibility. Some private interests were also said to be working on the problem, but their activities were surrounded by a dense and resonant silence. During the past year several plants have actually produced phosphoric acid in commercial quantities from phosphate rock by volatilizing the P_2O_5 in an electric or oil-heated furnace. This does not mean that it is a competitor of acid phosphate at present or anything like it. But it does indicate which way the wind is blowing and it may indicate that acid phosphate will some day be among the missing, though we hasten to add that the above is not a prediction.

And so, too, with nitrogen. Chilean nitrate is the original product and still has the largest share of the U. S. market. There are signs that the nitrate producers are waking at last to the desirability of using at least an embryonic chemical engineering technique and that competitive products will find not only a powerful trade combination ready to give battle but probably an alert technical staff aiding in the fight by lowering costs of production. Then there is ammonium sulphate from byproduct coke plants that has earned its right to be classed as a nitrogen carrier of the first rank. As a byproduct it can take a lot of punishment on price and still stay in the ring. Along the horizon is synthetic ammonia, and the threat of it will do much to increase the effi-



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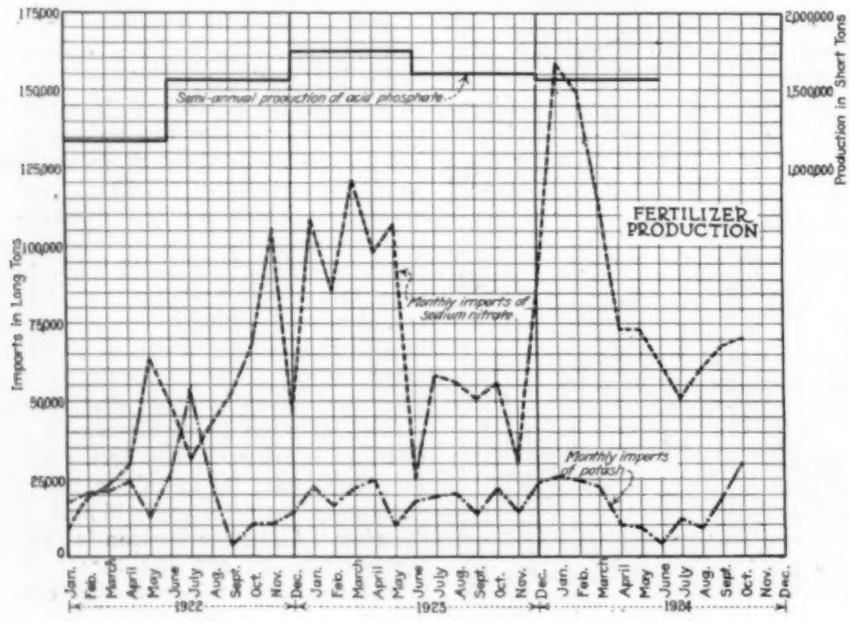
ciency of the other two processes. But it is not unreasonable to expect considerably more.

During 1924 the attitude toward synthetic ammonia has undergone a complete change. Formerly it was recognized as an indispensable war material and it was felt to be a fortuitous circumstance that the plants could be utilized to produce a material that was of some value during peace time. This year, however, has marked the actual realization that nitrogen fixation is of interest primarily because of its industrial and agricultural possibilities. The Muscle Shoals situation created a belief that there was a demand for fixed nitrogen which might easily have persuaded some one to jump into big-scale production. Fortunately this was escaped. Yet it is a fair prediction that within a few years the total fixed nitrogen production in the United States will exceed the capacity of the Muscle Shoals plant. The development of productive capacity in this country is steady and healthy. We are not, as has been often stated, behind the rest of the world in this field. We have, as a matter of fact, a larger tonnage of fixed nitrogen by direct ammonia synthesis than any other country excepting Germany and adding the potential tonnage of the Muscle Shoals plant we have a considerably greater capacity, again excepting Germany. During 1924 a 7- to 8-ton Casale process was installed by the Niagara Ammonia Co. The National Ammonia Co. of Seattle has been erecting a 3-ton unit. The du Pont interests have purchased the American rights to the Claude process and intend to erect a 20- to 25-ton plant. This seems to indicate industrial vigor.

For the technical developments of the year we must thank the Fixed Nitrogen Research Laboratory, which has carried out and published research that is of great significance to the industry. The only work on ammonia catalysts of industrial importance has been published during this year by the laboratory. The ammonia equilibrium has been studied and the data show more clearly the possibilities of the Claude process with its high pressures.

The Department of Commerce surveys prepared under the direction of Dr. H. A. Curtis have been published during the year and present a remarkable picture of the nitrogen situation in this country and abroad. They discuss Chilean nitrates and ammonia from coal as well as the various fixation processes.

The year has done another thing. It has removed the old idea that synthetic ammonia was an electrochemical process. Muscle Shoals really began that idea. But the only advantage of Muscle Shoals or of any other hydro-electric development, so far as nitrogen fixation is concerned, is the cheap production of hydrogen. Obviously hydro-electric power will not give cheap hydrogen where many industries are competing to use this power, for the price of it will be high. This would relegate electrolytic hydrogen to remote or undeveloped districts. It seems logical, then, to say that a new, cheap source of hydrogen must be developed entirely independent of hydro-electric power, which would diminish the importance of Muscle Shoals to cheap fertilizer, to the fertilizer industry and to nitrogen fixation.



Electrochemical Progress

Largely in Electrometallurgy and Electric Furnace Practice

ALTHOUGH 1924 can hardly be called a banner year in the technical progress of the electrochemical and electrometallurgical industries, developments that have taken place are evidence of consistent and healthy growth.

Electrodeposition of metals has progressed accordingly; one company has developed its technique of copper production to allow a selling price of 8 cents per pound. Zinc's progress has been rapid, due in part to the work of Tainton and Pring, whose experiments in plating the metal at increased current densities have met with success. In nickel, the event of the year has been the closing of the plant of the British-American Nickel Co. that resumed operations early in 1923. The Hibbenet process could not fully meet its competitor in the product of the Mond process.

Production of the lighter metals by electrolysis of fused salts has assumed increased importance due to the growth of radio and to the rising demand for strong lightweight metals for construction. Aluminum and magnesium undoubtedly hold first place in the latter respect, although the researches of the University of Illinois and of the Kemet Laboratories in Cleveland have brought out the value of beryllium for this use. Metallic calcium for argon purification and for use in radio tubes also has been turned out in increasing quantities by electrolytic processes during the year.

Increased attention to the technique of electric furnace problems has continued to be largely focused on the development of satisfactory refractories. Although the year has noted the addition of several alloys to the list that may readily be pro-

Technical Progress of the Year

duced in the electric furnace at a comparatively low figure, the goal of the electrometallurgist to go to a working temperature of 3,000 deg. C. has not been attained. One concern has placed an induction type furnace on the market that is claimed to work satisfactorily up to 2,900 deg. C., using a thoria refractory. It is maintained by some engineers thoroughly in touch with this type of furnace that although the refractory service condition is somewhat easier to meet, the real solution of the high-temperature problem lies rather in the development of a new type of furnace. Magnesite and dolomite roofs that are water cooled have been tried with satisfactory results in some quarters and despite loss of heat thereby entailed, the high temperature and consequent speed in operation have led to considerable optimism over this innovation. In connection with this subject the increased use of the Söderberg electrode must be noted—a trend that promises to continue.

Small-Size Coke Ovens for City Gas

This Is the High Spot of Technological Progress in Both Coke and Gas Fields

IMPROVED METHODS of gas manufacture, purification and distribution developed or first applied in 1924, although important, are collectively a less conspicuous part of that year's progress than is the important change in attitude of the industry toward house heating and industrial gas utilization. Barely 10 years ago lighting, cooking and a small amount of water-heating business engaged practically all of the attention of the gas industry. But now the lighting business is forgotten; the cooking business, though actively advanced on every occasion, takes second place; and industrial gas sales and the problems of house heating by gas now dominate the industry's investigations.

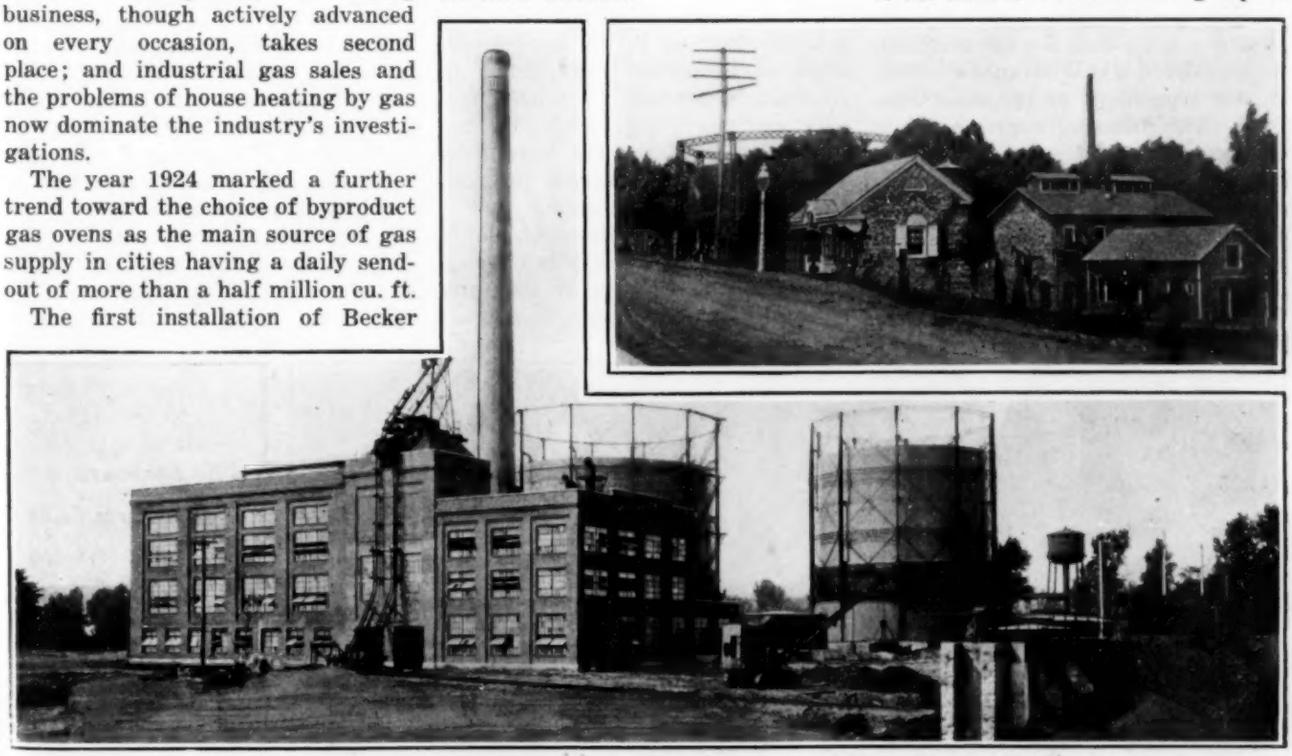
The year 1924 marked a further trend toward the choice of byproduct gas ovens as the main source of gas supply in cities having a daily send-out of more than a half million cu. ft.

The first installation of Becker type small gas ovens went into operation in January, 1924, and there are already seven of these plants in operation or under construction. The small gas ovens embody exactly the same principles and details of construction as the larger ovens, and when using the same coals, will produce coke of identical quality. Gas companies in small or medium sized cities can now produce, for the first time, a coke that will successfully compete with any coke that may enter their markets.

The gas ovens may be heated either with producer gas made from breeze and a portion of the small coke, or with a part of the coal gas that is obtained. The amount of coal gas available for sale can be reduced from the maximum amount by as much as 40 per cent on short notice, and further great changes can be made by varying the coking time.

There is a greater degree of financial stability in the manufacture of gas in byproduct ovens than by any other process. A water-gas operator is at the mercy of market prices, since he is compelled to buy coke (or anthracite) and gas oil in a highly fluctuating market, yet has to sell gas at a low fixed price. The finances of a byproduct oven coal-gas plant, on the contrary, are largely independent of the price of its principal raw material, bituminous coal, since the coke from a ton of coal is always worth as much as or slightly more than the ton of coal.

The year 1924 was characterized by a large increase in coke-oven capacity in the United States. During his period, 644 full-sized coke ovens, all of the Becker type, were put into operation. This new construction added approximately 5,500,000 tons to our annual coal-carbonizing capac-



Twenty-five Years of Gas Progress. The Philadelphia Suburban Gas and Electric Co. in 1899 and 1924

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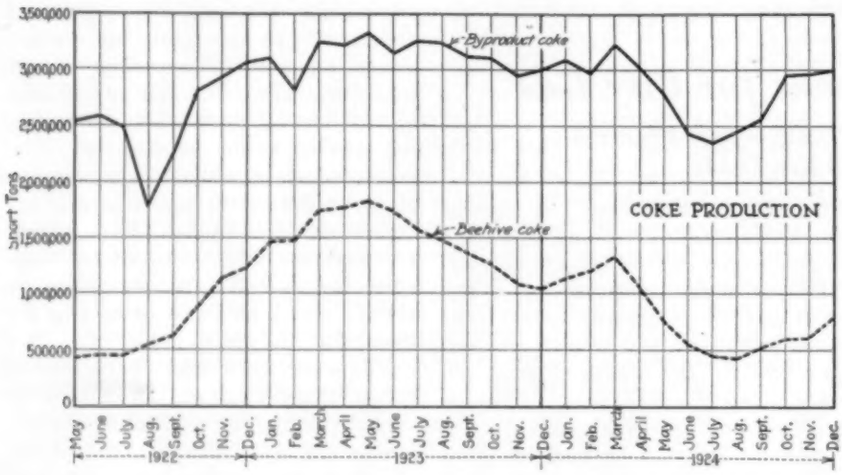
ity. Coke-oven construction now in progress will add 330 more ovens. These figures, when combined with those given under the gas-oven heading, make an impressive total that is very gratifying when viewed from the standpoints of conservation of our natural resources and national defense, as well as industrial growth.

The largest new oven installation that began operation in 1924 was the Carnegie Steel Co. plant at Clairton, Pa. At this plant about 350 new Becker-type ovens were put into operation about the middle of the year.

Already they are demonstrating that the large size Becker oven can be considered a real advance over the earlier types built by the same company. The principal improvement is in accuracy of temperature control throughout the oven, which results in a shortened coking time and therefore greater output per thousand dollars of investment.

A battery of Becker ovens at Provo, Utah, is successfully producing coke for a small blast furnace, on 14 hours coking time, from what is undoubtedly the poorest coking coal yet coked on a commercial scale in America. The coal contains from 40 to 42 per cent volatile matter, and about 10 per cent oxygen (dry basis).

At Alkali, Ohio, a battery of Becker ovens is producing a hard blocky coke for calcining lime. The operators are very enthusiastic over the new coke, since it enables them to save 90 lb. of coke on each 550 charges daily, as compared with former practice.



There seems to have been little new development in the low-temperature carbonization field either in America or abroad. Reliable yield data and operating results on the Piron-Caracristi process have been awaited with considerable interest, but are not yet forthcoming.

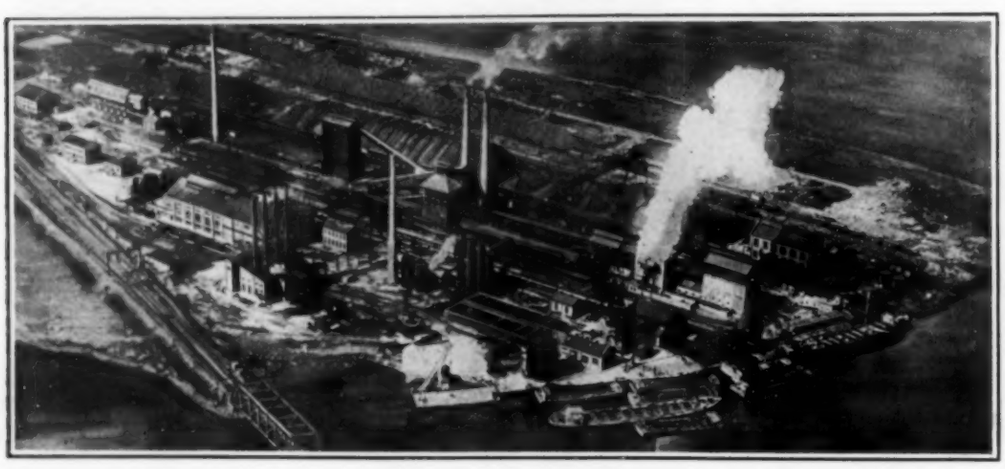
The British Fuel Research Board has taken a forward step in offering to test and publicly report upon any low-temperature carbonization process, provided that the interested concern will comply with certain requirements.

There is considerable interest in Continental Europe in the Bergius process for the hydrogenation of various oil and tar residues, bitumens, etc., under pressure. A large yield of oils is reported, even from low rank powdered coal, if it is suspended in oil. European experimental work has also continued on the pressure extraction of coal.

Several new cycles of water-gas machine operation had extensive trial during 1924. Perhaps the most conspicuous of these developments was in the large number of installations in which "back run" apparatus was added to existing plants. Practically all water-gas equipment manufacturers now offer this or equivalent equipment on new machines when desired.

The use of bituminous coal for water-gas generator fuel, which has suffered a setback during recent years because of the lower machine capacity that often results, gained a new lease of life during 1924 by the results of tests by the U. G. I. Contracting Co. with the Pier process.

The addition of waste-heat boilers to water-gas sets continued at an increasing rate during 1924. It appears that this accessory has come to stay in the gas industry. Automatic control of water-gas sets is also advocated by substantially every important builder. Experience with this equipment has demonstrated that it can now be regarded as well beyond the experimental stage and worthy of consideration for any large plant. Results reported in 1924 seem to clinch this point. Both automatic



The Seaboard By-Products Coke Plant at Jersey City Taken From an Airplane

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charging of water-gas machines and the use of mechanical water-gas charging devices upon an intermittent schedule were conspicuous developments of the year.

The older systems of liquid purification of gas, although used in several plants, had given difficulty on account of the odors produced and had not proved satisfactory for exclusive use, since final traces of hydrogen sulphide had to be removed with iron oxide. This new process can be used alone for complete removal of H_2S and operates without objectionable odors. It has been operated for several months on a commercial scale at the Seaboard plant.

Economic Changes in the Soap Industry

Raw Materials and Consumption Furnish Problems for the Technologist

THE soap industry has not been quite so pessimistic as the New Hampshire native. He was asked how the apple crop was coming on, and his reply was, "Oh, about as usual—about half a crop." On the whole the soap manufacturers have been busy, and although they marked time to a certain extent during the first half year in conformity with general business conditions, the second half year has shown considerable improvement. It can probably be called a normal half-year. The technical improvements in the industry have not been outstanding. As a rule soap chips, flakes and powders—in short more soluble soap—have come into their own at the expense of bar soap. This has led, of course, to an increased attention to the technology of producing powders and chips. During the past year the successful operation of spray driers for powdered soap has been achieved to an extent that indicates a definite tendency in the industry. Furthermore, an increased production of glycerine has turned attention to a new type of vertical tube evaporator, designed to give positive circulation.

Raw materials for soap form an interesting point of discussion. It is expected that the demand for edible fats in Europe will be greater next year and that consequently higher prices for them will result in this country. One authority reports that the greatest technological development has taken place during periods of high-priced fats. Another phase of the same problem which is history and not prediction is the effect of high tariff on the supply of foreign hardened fats and on the cheap imported vegetable oils susceptible to the hardening process. This has resulted in a curtailment of the use of hardened fats, but the industry has been fortunate in having a cheap coconut oil during this period.

Another interesting market tendency that has its effect on the technology production is the gradual displacement of yellow laundry soap with white laundry soap. This is more than a tendency and although some yellow laundry soaps will continue locally to hold their own, there is, nevertheless, a distinct drift toward white products.

Two more things of importance to the technologists in the soap industry, and to the industry itself, deserve mention. One is the cease and desist order of the Federal Trade Commission served on one of the large soap companies as a result of advertising. The complaint claims misrepresentation and deception. The finding was that the practices referred to constituted unfair methods of competition. The questions involved were technical and there exist no adequate specifications in the industry. However, the net result is likely to be a sincere attempt to stay within the boundaries of the truth on the labels and in the advertising of soap, and it is not improbable that the technical men will be called into council by the advertising men for a co-operation that has largely been neglected in the industry.

The other point worthy of mention is the suggestion that originated in the columns of *Chem. & Met.*, that a technical organization be formed among the technical men in the soap industry. There resulted much discussion, sufficient at least to show that there are matters which such an organization could handle to the benefit of the industry as a whole as well as for the advancement of the individual members.

Salt Producers' Activities

Iodized Salt and a Method of Discharging Evaporators

THE SALT INDUSTRY is a conservative industry. At least that is the vote of practically every technical man connected with the industry with whom we have had the pleasure of contact. And yet with all its conservatism there has been considerable interesting progress during the past year. Perhaps the two most interesting developments are, first, the adoption of a pumping method for removing salt from evaporators, and second, the production of an iodized salt.

In the past it has been customary to remove the salt from the bottom of the salt evaporators by means of an elevator. This method was never satisfactory, inasmuch as the salt came into contact with a great deal of iron during its travels. During shut-downs this iron rusted badly and the ultimate result was off-color salt. This has been a serious drawback and finally several plants have adopted a pumping method in which a centrifugal pump is connected with the bottom of the evaporator and pumps a continuous stream of salt suspended in brine out of the evaporator. With copper-lined and bronze-fitted pumps the discoloration is practically eliminated and the method is therefore far superior to the former method, in compactness, in cleanliness and in cost. Occasionally the copper pipe lines clog up and one plant at least has used rubber dredge hose for handling the salt. This permits relatively inexperienced operators to locate the stoppage and to clear it by crimping the line.

The other point of interest in the salt industry is the production of iodized salt. It has been shown by various experiments that goiter is largely due to iodine starvation and that a small amount of iodine will almost entirely eliminate the possibility of it. Physicians in the Middle West have been much exercised about the situation and have cast about for a method of giving to the average inhabitant of the Middle West a small quantity of iodine in food. Doping the water supply would have been exorbitantly expensive and wasteful, as only a little of it is drunk. It then occurred to

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the Michigan Board of Health that table salt was the best method. Several salt companies have prepared this material, but the sale of it has been disappointing up to the present time. It is interesting to note that one progressive state, Wisconsin, which is blessed with pure food laws, cannot permit the sale of this iodized salt within its borders. Its pure food laws prohibit the admixture of any medicinal ingredient in a standard food product. The iodized salt, by the way, contains about 0.02 per cent of sodium iodine and is sold at the same price as ordinary table salt, when it is sold. The experience of these salt producers is truly typical of pioneers in any line. But it is almost a foregone conclusion that sooner or later they will reap a reward.

A Case of Unusual Technical Progress

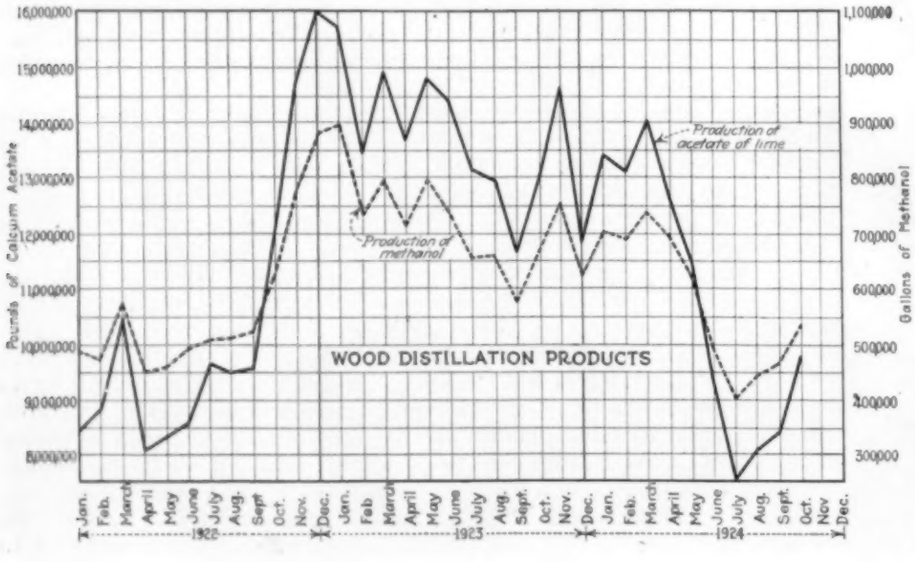
Wood Distillation Presents a Striking Contrast to the More Sluggish Industries

IF THAT mythical character, the average chemical engineer, ever sat back of an evening and wondered what was happening to his brothers in various industries, he would eventually come to wood distillation. He might then realize with a start that he knew comparatively little about the industry. Relatively few people know much about it. But the industry is doing very well, thank you, and the steady progress that has been characteristic of the last 10 years can also be recorded for 1924. Many developments that began some months earlier came to fruition last year. One of these is the direct preparation of acetic acid as glacial acetic acid from pyroligneous liquor. Two different processes are being used, one at least on a commercial scale. The advantages of such procedure are obvious. It avoids the commercial neutralization of the crude acid with lime for the formation of acetate of lime, the distillation of the methanol from the neutralized liquor and the evaporation of the calcium acetate liquor. In addition, the final step of reconverting the calcium acetate to acid is avoided. It will permit the wood distillers to compete successfully with the synthetic acetic acid, which is a desideratum.

The utilization of waste heat in flue gases to dry the wood before it is put into the kilns is also a step in the right direction. It results in a decreased consumption of fuel, a longer cycle for the actual distillation and a consequent more careful firing. This is along the line of plant tests carried out last year, using careful heat control with excellent results as regards both the quality and yield of charcoal and the yield of acetic acid and methanol.

One of the most interesting happenings of the year is the commercial success of the Stafford process. The first plant to use the process is the Tennessee-Eastman Corporation at Kingsport, Tenn. The several years of development are behind and the plant is embarked on successful commercial production. The photograph on the next page is a recent one of the Tennessee-Eastman plant, a veritable treasure house of chemical engineering. It is a story of which *Chem. & Met.* hopes to tell at least a part some day. Another plant is that of the Henry Ford company at Iron Mountain, Mich., which, however, has only recently started operation. With the possible exception of one other process, at the present time not in operation and of unknown success, the Stafford process is the first to use small wood in the distillation process. Even the Stafford process does not use sawdust, the chips being screened before retorting. There is, therefore, no commercial process for using sawdust as a raw material for wood distillation, although this is still an aim of the industry.

The use of hardwood creosote as a wood preservative has again come into the limelight with some favorable reports from European practice. There has also been made during the past year a careful study of the properties and uses of methanol and acetone at Mellon Institute and studies are now in progress on acetic acid, wood oils and other byproducts. This is done with a view to suggesting new uses for these materials, and of developing markets to points of greater consumption.



Descent From Perilous Heights

In 1923 there were boom times in the wood chemical plants and total production reached the unprecedented value of $29,695,423—an increase of 206.8 per cent from the previous census year of 1921. Stocks were unusually high at the beginning of the past year and these helped to bring about a very critical period of curtailed production. The curves for methanol and calcium acetate shown in this chart are indicative of the trend of the industry during the past 3 years.

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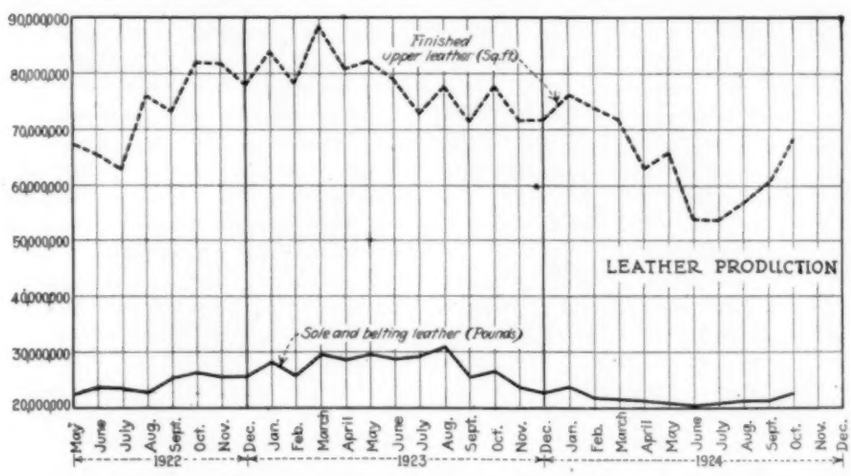
Leather Industry Needs Stimulant

Many Valuable Data Available That Could Be Applied to Industrial Operations

ALTHOUGH there were a number of important contributions during 1924 to knowledge of the fundamental mechanism of tannery operations, it must be recorded that the organizations responsible for the advances represent only a deplorably small proportion of the firms in the industry that should be engaged in fundamental research. The provision of adequate facilities for the Tanners Council Research Laboratory through the dedication of the new laboratory building at Cincinnati is a step in the right direction, but individual manufacturers should not complacently assume that they are thereby relieved from all necessity for conducting fundamental investigations themselves. Nor should it be forgotten that there has already been published an immense amount of fundamental data, sufficient in fact to revolutionize the entire industry were it but intelligently applied to the particular conditions existing at each plant. Too much stress cannot be placed on this point of utilizing available data. To a small extent it is being done, as is evidenced by the marked increase in the use of the hydrogen electrode in control work, but the possibilities have hardly been touched.

Of particularly wide interest were the studies by Wilson and Gallun relating foot comfort to the composition of the leather used in making the shoes. Chrome leather is less comfortable than vegetable-tanned leather, because it shrinks and expands more with variations in humidity. In going from 0 to 100 per cent relative humidity, the range of of area increase for specimens obtained from various parts of the world was between 5.3 and 7.7 per cent for vegetable-tanned leathers, and between 15.1 and 23.0 per cent for the chrome leathers.

In actual wear tests, with a chrome shoe on one foot and a vegetable-tanned one on the other, this difference in shrinkage was very marked. In going from 100 to 0 per cent relative humidity, the chrome shoe shrank from a D to a B width, while the vegetable shoe did not shrink as much as one-half width. This property of chrome leather to change in area is attributed to its high content of protein and sulphuric acid.

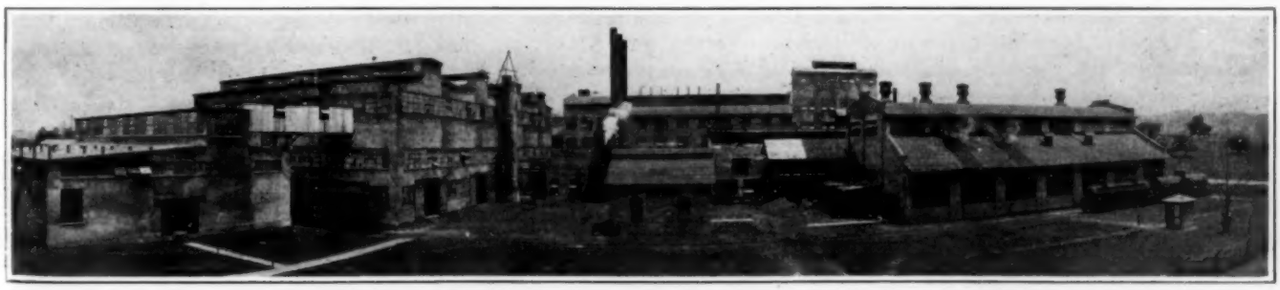


The related properties of strength and stretch were also investigated by Wilson and Gallun. Kid leather has a greater tendency to stretch than calf leather, which might be expected from the loose structure of goat skins, giving less protein per unit cross-section. Structural differences also explain why calf leather increases steadily in strength with increasing oil content, while little effect is noted with kid.

New light was thrown on the complicated mechanism of vegetable tanning through studies. Using pure tannic acid, the validity of the Procter-Wilson theory based on the Donnan equilibrium was conclusively shown. It was also demonstrated that quinone tans in alkaline solutions while tannic acid does not, but that when the effects of the two agents are superimposed, a result identical to that in commercial tanning materials is obtained.

The soaking process was studied from a practical viewpoint and it was found that soluble protein is leached out of skins in soaking, the amount increasing with rise in temperature, but that the specific conditions must be worked out by each tanner to suit his own particular case.

In studying bacterial count of soak waters, peculiar discrepancies were found as salt was added, explainable only on the assumption that bacteria behaved like other colloidal dispersions. Thus addition of salt to the culture medium caused the bacterial count of a given soak water to rise from its original value of 610,000 to 11,000,000 at 0.05 molar NaCl and then to drop to zero bacteria per c.c. at molar concentration of NaCl.



The Stafford Process in Action at Tennessee-Eastman Corporation, Kingsport, Tenn.

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The Heavy Acids Mark Time

Inevitably the Progress in This Field Has Been Small

IF YOU had raised a large family of children to maturity in a house that was sufficiently large to hold them; and, if they had all married and moved to homes of their own, your house would be a trifle large for you and your wife, would it not? That is the unfortunate position of the three heavy acids at the present time. The peak of production during the war required more plant capacity than America can use in peace time. As a result new installations have been infrequent and such technical developments as have been carried out are almost invariably in the direction of better operation of existing equipment.

In the case of *nitric acid* there has been little change except the continued replacement of Hart condensers with acid-proof iron S-bend condensers and a tendency toward closer and closer supervision. A new design has recently been completed by W. N. Hough and the Duriron Co. that promises to be the first efficient small-scale plant yet designed for nitric acid production.

Hydrochloric acid is still more sluggish. That favorite dream of the muriatic operator, the mechanical furnace, seems still some distance ahead. Reliable first-hand information shows that European practice is not very much ahead of our own despite reports to the contrary. Their mechanical salt-cake furnaces are interesting as indicating future possibilities, but there is none that would justify its installation in this country at the present time. Hydrochloric acid prices are likely to stay low, because, whether it is made by the electrolysis of salt and subsequent combustion of chlorine or by the action of sulphuric acid on salt, there is another product that will help to bear the expense of production. This helps to conceal the losses and makes it possible for the producer to keep up with the exacting competition of acid made by the other process, to say nothing of cut-throat methods of the impecunious and cash-hungry war baby.

Sulphuric acid used to be made from pyrites and the phrase was current that anyone that used brimstone was a millionaire. Times have changed and still are changing. More and more plants are changing to brimstone. There are several answers, among the most important of which is the price and quality of brimstone. A promising innovation patented recently is the Stantial double Glover tower. The first commercial installation is operating with marked success.

Andrew Fairlie, consulting chemical engineer, of Atlanta, Ga., has made a brief review of the sulphuric acid industry for 1924 at our request.

During the first half of 1924 the demand for sulphuric acid, which had been reasonably active in 1923, suffered a sharp decline. In August the fertilizer companies began mixing for the fall trade, and this stimulated the demand for acid, and during the remainder of the year the demand was quite brisk. Competition has been keen among producers, however, and prices for commercial acid have continued low, very close to cost of production and in some instances perhaps less than actual cost.

The U. S. Department of Commerce reports that during the first 6 months of 1924 the fertilizer manufacturers of the country produced 797,174 tons of sulphuric acid. This production was reported by 88 fertilizer manufacturing establishments, 60 of which were in the Southern district and 28 in the Northern and Western districts. For the first half of 1924 the fertilizer manufacturers reported a consumption of 886,901 tons of sulphuric acid, for the manufacture of 1,584,195 tons of acid phosphate. This compares with a consumption of 886,454 tons of acid in the fertilizer industry for the last half of 1923 and with 933,824 tons for the first half of that year. Statistics for the last half of 1924 are not yet available, but they are likely to show, when published, a decided increase in quantity of acid used by the fertilizer manufacturers, as compared with the figures for the first half of the year.

A small contact plant for the Eagle-Picher Lead Co., of Hillsboro, Ill., begun in 1923, was completed and put into operation in 1924. This plant operates on the roaster gases of a zinc-smelting plant, enriched by brimstone gases. A modification of the Grillo-Schroeder process is used.

The Armour Fertilizer Works has contracted for the erection, at Jacksonville, Fla., of eight acid chambers of the Mills-Packard water-cooled type, to replace a set of old-style chambers destroyed by fire in July, 1924. This will be the first installation in the United States of a Mills-Packard chamber plant, although in England and in Continental Europe this conical-shaped water-cooled type of chamber has made considerable headway.

A new 50-ton acid concentrator, "Chemico" type, was erected by the Tennessee Copper Co., of Copperhill, Tenn., and this was in operation by April of 1924.

Several plants for the recovery and concentration of separated sludge acid reclaimed from oil-refining processes were erected by the Chemical Construction Co. of Charlotte, N. C., during 1924.

A 12-ton 66 deg. acid concentrator was erected for the Carbide & Carbon Chemical Co., South Charleston, W. Va., by the Chemical Construction Co. At the close of the year a 20-ton 66 deg. acid concentrator, and a 35-ton sulphuric acid contact plant, for the Huasteca Petroleum Co., Tampico, Mexico, were under construction by the aforesaid construction company.

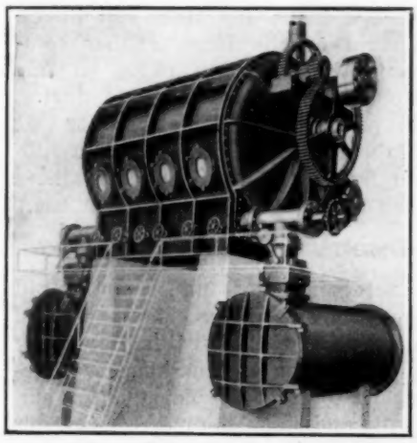
Within recent years various new processes for the manufacture of sulphuric acid by means of oxides of nitrogen but without lead chambers have been patented, and attempts have been made to exploit some of these. The new proposals include such devices as the substitution of water-cooled lead pipes for lead chambers, and a variety of mechanical appliances for spraying nitrous vitriol into a stream of sulphurous gas passing through a conduit containing nitrous vitriol. Some of these ideas have been tried on a commercial scale, but thus far none of them has made any material progress in the United States. So many of these new proposals have been patented, differing only in the kind of mechanical equipment employed for showering the nitrous vitriol into the sulphurous gases, that notable success for any one of them seems unlikely.

Developments in the Equipment Field

Editorial Staff Review

UNIT PROCESS equipment development in 1924 evidenced no markedly new trends. The tendency toward developing equipment that permits several steps of a process to be accomplished in the same apparatus, a tendency evident for several years past, and also the companion tendency of long standing, that of making control and operation easier and more automatic, continue to mark the few new designs of strictly chemical engineering equipment that the year brought forth.

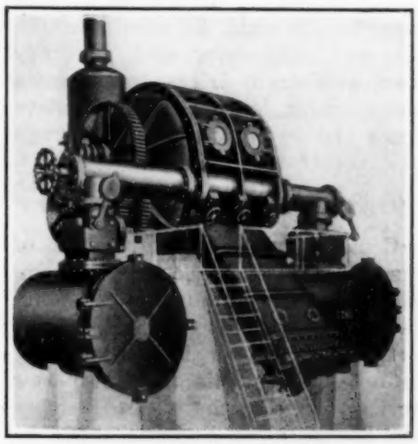
When one turns, however, to the more general line of plant equipment such as power equipment, conveyors, controlling devices, pumps and electrical equipment, the advances have been more numerous. In this field there are also two distinct trends, which, while in evidence for some years, have, due to immigration laws that cut down the available supply of common labor, become much more marked in 1924. These are the trends toward the adoption of labor saving equipment and automatic control.



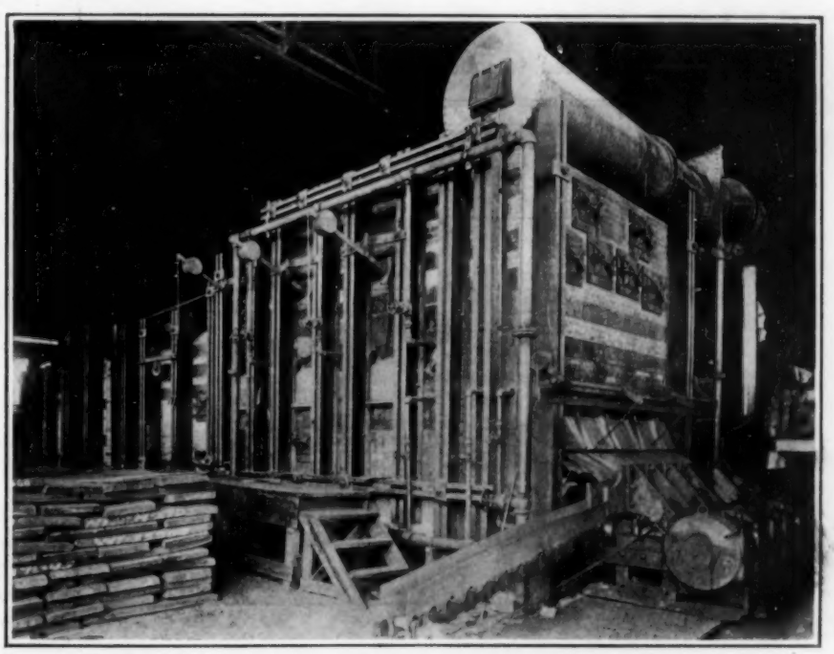
Vacuum Drum Drier, With Novel System of Applying Film to Drum

Among the outstanding contributions to process equipment are the vacuum drum drier and the combined vacuum evaporator and drier placed on the market by the Chemical & Vacuum Machinery Co., 1606 Main St., Buffalo, N. Y. The particular feature of the vacuum drum drier is the method used for placing the film on the drum. This is done by means of a projecting roll, which is a cylinder with a thread chased on its outer surface over the entire length. This cylinder is placed on a horizontal axis in a small reservoir in the drier casing, directly under the drier drum. Beside it is another small reservoir, feeding the first and acting as a liquid level control tank. The projecting roll is revolved at a speed depending on conditions. Its lower portion dips into the liquid in the reservoir, and the thread, as it moves upward, carries with it a certain amount of this liquid. A deflector is so placed as to determine the amount so carried. That part that remains on the thread is thrown off by centrifugal force, each thread delivering a continuous stream of small drops that impinge on the drum surface, building up a film of the desired thickness. The threads on the projector being continuous and each thread acting independently as a sprayer, the streams of drops impinging on the drum surface move continuously in the same direction, following one another, thus building up a uniform film. This method is said to give the advantages, among others, of a denser and more uniform product and also to do away with the likelihood of scorching during drying.

The combined vacuum evaporator and drum drier substitutes for the projecting roller a tubular evaporator, attached to the under side of the drier casing at an angle of about 45 deg. The liquid level in the tubes is maintained automatically. Due to the formation and expansion of steam, the boiling liquid in the tubes is rapidly carried upward along the walls, part of the water content being vaporized meanwhile. The constant formation and increasing volume of steam increase this upward velocity, until at the outlet of the tubes the liquid has sufficient velocity to impinge with force against the drum and there deposit a film. The thickness of this



Combined Vacuum Drier and Evaporator



View of a Reheating Furnace Built on the Hermansen System and Equipped With the Hermansen Recuperator

Developments in the Equipment Field

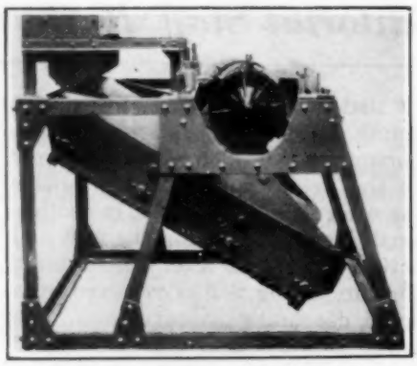
film is regulated by a spreader, surplus being returned by gravity to the evaporator. This type of construction is said to eliminate the separate evaporator unit generally used with drum driers, to eliminate one operator, lessen heat losses, save space and do away with any storage of concentrated liquid.

Improved Combustion Equipment

Combustion equipment, while of the greatest importance in the chemical engineering industries, takes its development trends from other fields as a general thing. It is interesting to note, along this line, two new devices. One of these, the Hermansen Recuperative Furnace, made by the Combustion Engineering Corporation, 43 Broad St., New York, was apparently developed with the needs of the metallurgical field in view, but it will undoubtedly have wide use in glass plants and other similar factories. The feature of this furnace is the built-in recuperator, of specially made refractory shapes. It is said that this design permits the saving of a large portion of the heat ordinarily wasted up the stack in the flue-gases.

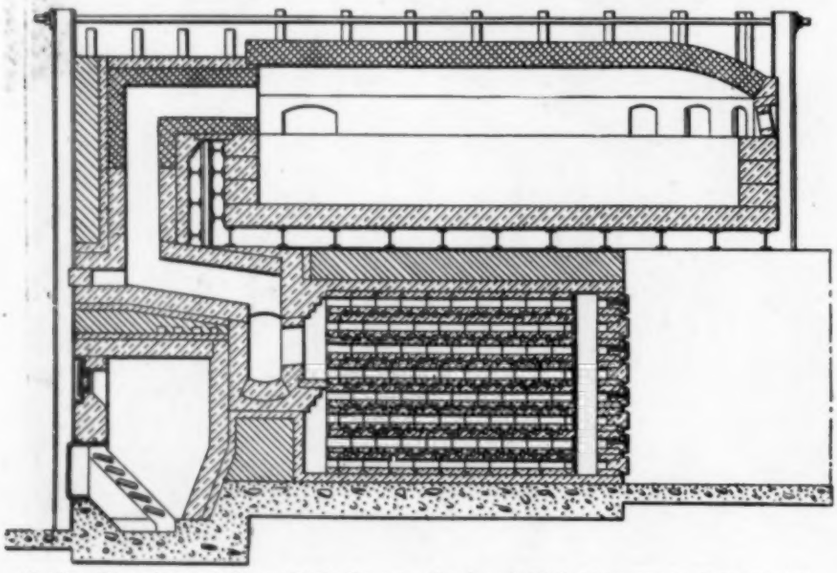
The other device noted above is the Gilbert fuel system for varnish fires, made by the Graff Engineering Corporation, 150 Nassau St., New York. This device, designed to fill a special need of the varnish industry, is now being adapted for application in other industries.

It is a furnace designed to make the fullest possible use of radiant heat and may be fired by either oil or gas. Combustion of this fuel is caused to take place at the entrance of a short tunnel terminating in the heating chamber proper. The tunnel and the chamber are both lined with a monolithic refractory lining. The tunnel length is varied to suit the installation. The hot gases heat the walls of the tunnel and combustion is completed before they pass from it. Almost all the heat remaining in these gases is then extracted in the heating chamber by its walls. The radiant heat from these heated refractory walls then serves to heat the varnish kettle or other device to be heated, which sets directly above the opening in the top of the chamber.



The Mitchell Vibrating Screen, Showing the Vibrator Above the Screen. This Screen Is Built to Connect Direct to the Line on 220, 440 or 550 Volt, Three-Phase, Sixty-Cycle Current. Vibrations Are Transmitted Through Side Plates to the Screen Cloth

Air preheating, practically the same as recuperation, has been receiving much attention from power plant engineers of late. As a result there have been several designs of air preheaters placed on the market. The most usual type is that in which the incoming air and the outgoing hot gases are separated by thin metal plates, heat being transferred from the gas to the air through the plate. The Combustion Engineering Corporation, 43 Broad St., New York, and Connery & Co., Philadelphia, each brought out preheaters of this type last year.



Section Elevation of Glass Tank Furnace Equipped With Hermansen Recuperator, Located Directly Beneath

Acid-Proofing Containers

Corrosion problems are always with us and as a consequence much effort is spent on devising means for overcoming corrosion. One of the year's notable developments in this line is the production of rubber, acid-proof linings for tank-cars, storage tanks and other containers. Several of the large rubber companies have been working on this problem for some time and during the past year the Miller Rubber Co., Akron, Ohio, has brought out a rubber lining for tanks and containers that is giving good results in use.

Disintegrating and Separating

Screening has undergone rapid improvement in recent years and many new types of shaking, gyrating and vibrating screens have been designed to meet the demand for efficient and trouble-proof equipment for this unit process. The past year saw several noteworthy additions to this line. The Link-Belt Co., Philadelphia, brought out a simple and rugged vibrating screen wherein the vibrating is caused by the rapid rotation of an unbalanced pulley. Somewhat of the same type is the new Mitchell screen, made by the C. W. Hunt Co., New York. This screen obtains its vibration from a rapidly rotating assembly in which two eccentrically held steel balls travel around the circumference of the rotator. The Sturtevant Mill Co., Boston, Mass., developed a new vibrating screen of simple and sturdy design that is particularly adapted to the screening of such materials as sand, gravel, crushed rock and coal, both wet or dry, between 2 in. and 10 mesh or finer. Another new vibrating screen was brought out by the Robins Conveying Belt Co., New York. This screen,

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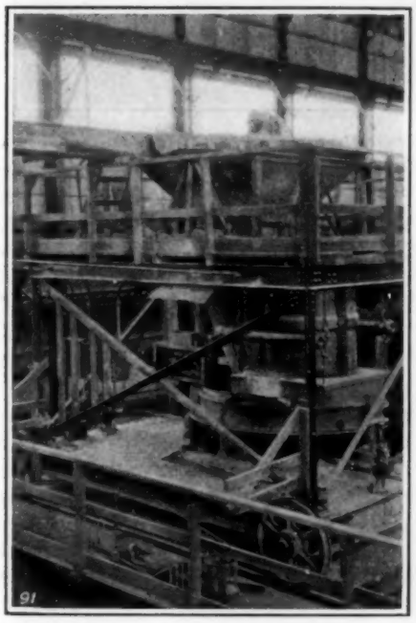
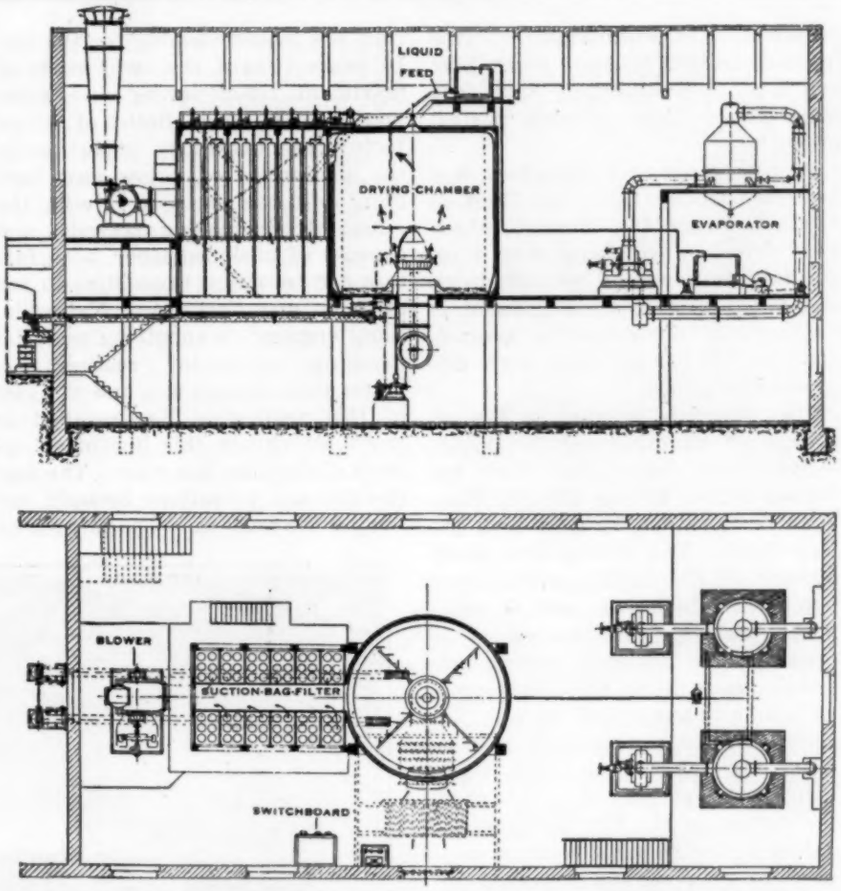
called the "Bronco," is a single shaft device with a balanced unit supported on a cast-iron frame. It has an eccentric support and is adjustable by change of speed, change of incline and variation in vibration.

A development of prime importance, started several years ago in England but not reaching this country in commercial form until 1924, is the Premier colloid mill, made by the Premier Mill Corporation, Geneva, N. Y. This device is designed for grinding to colloid fineness and its use is proving extremely advantageous in many fields where colloids are encountered or in which it is a help to have the material at some stage in the manufacture in a colloidal state. The Premier is a colloid mill of the hydraulic disintegrator type, in which the disruptive action occurs within a liquid in which the solid material is held in suspension as it is forced at high speed between the cone-shaped rotor and the stator, between which two elements the clearance is small. Besides being useful for making fine disintegrations and colloid suspensions, this mill is also used in making emulsions, suspensions, mixes, separations, purifications and washings.

An interesting accessory to grinding mills appeared during the year in the Gagnon automatic feed control, made by the Gagnon Manufacturing Co., Lowell, Mass. This device, designed primarily for use with the well-known Raymond type of mills, operates by means of the vacuum indicator supplied with the mill. It controls the feed to the mill absolutely and is said to insure a uniform product and maximum output from the mill at the same time.



Installation of Acid Batch Weigher at the Acid Phosphate Plant of the Tennessee Copper Co., Lockland, Ohio



Typical Installation of the Krause Spray Drying System, Controlled in the United States by the Chemical Construction Co., Charlotte, N. C.

The Raymond Bros. Impact Pulverizer Co., Chicago, Ill., brought out a new unit pulverizer, designed particularly to fill the need of powdered coal-burning installations in which a small capacity pulverizer is needed. This mill is of the swing hammer type. The fineness is adjustable. It is made in sizes of 500, 1,250, 3,000 and 4,000 lb. per hour, 95 per cent through 100 mesh, and requires 10, 25, 50 and 60 hp. respectively.

Acid Batch Weighing

One of the most difficult of operations is that of accurately proportioning the amount of acid entering into a mixing process. This difficulty, particularly prevalent in the making of acid phosphate for fertilizer, has been solved by the introduction of an accurate batch weigher for acids, made by Stedman's Foundry & Machine Works, Aurora, Ind. This is a tank of reinforced lead, mounted on a platform suspended from a balanced beam scale of the four-point suspension type. The tank bottom is conical, insuring full discharge. The tank inlet is operated automatically and the outlet may be so operated or it may be controlled by hand.

Drying by Spraying

The Krause process of spray drying, a patented German process, was introduced into the United States in 1924 by the Chemical Construction Co., Charlotte, N. C. This process works on a novel scheme and is said to be eminently successful. Liquid to be dried is sprayed into the atmosphere of a drying chamber by means of a rapidly whirling disk. The liquid is fed onto the center of the disk, which revolves in the horizontal plane, and is flung, by centrifugal force, from the periphery. A current of heated air is passed through the mist thus formed in the drying chamber and the material is dried

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practically instantaneously. This method is said to save much heat and labor and, especially with food materials, to give a more perfect product.

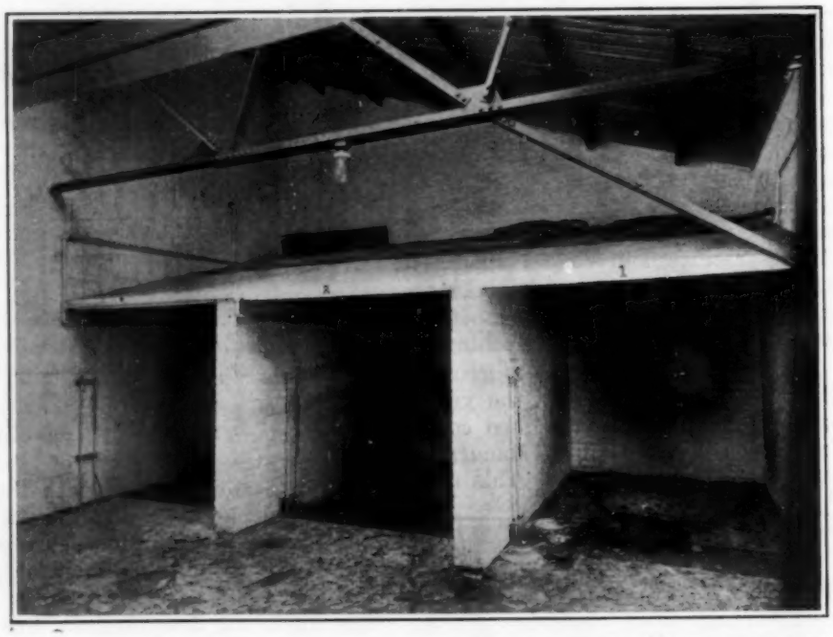
A new drive for agitators was brought out by the New England Tank & Tower Co., Everett, Mass. This drive, of the bevel gear type, is totally inclosed and operates in an oil bath. As a result, alignment is maintained, lubrication is assured, and smooth operation at high efficiency is attained.

The Mauclere system, a French method of handling volatile liquids safely, was introduced into the United States by the Liquids Handling Corporation, 21 East 40th St., New York. This system is a development of the duplex displacement pump, in which one central pneumatic station, with reservoirs of pressure and vacuum, permits the simultaneous filling and emptying of an indefinite number of vessels. The valves operate automatically in cases where the object is to supply liquid under constant head at points above the storage level. For filling cans or drums when the same vessel is to be used for elevating the liquid and giving accurate volumetric measurement it is usual to operate the valves by hand. For cases where the volatile products are flammable or corrosive, nitrogen or some other inert gas is used in the compressor system.

Developments in the Power Field

The outstanding contribution of 1924 to the power field, in so far as the individual industrial plant is concerned, is the double-acting two-cycle Diesel engine developed by the Worthington Pump & Machinery Co., Harrison, N. J. This engine is said to almost halve the weight per horsepower as compared with other types of Diesels now in use. It also permits the development of almost twice the horsepower per cylinder. The economy is said to be as great as that of the best oil engines heretofore developed, while the dimensions, weight and cost of construction per horsepower approximate those of the reciprocating steam engine. These facts should make this engine a real competitor of the steam engines over a much wider field than that formerly open to the Diesel engine.

Progress in the handling of materials has moved steadily for the last 10 years toward the twin goals of maximum labor saving and automatic operation. Both of these factors are extremely important in the attainment of a low unit handling cost and, moreover, with the constantly increasing scarcity and expense of unskilled labor, both factors are becoming necessities to the average manufacturer. Naturally, those engaged in supplying material handling equipment realize this better than anyone else and the fact of this realization has resulted in much activity in this line of equipment during the last year. The new designs and inventions brought out during the year were literally legion and of this number *Chem. & Met.* described one about every second week.



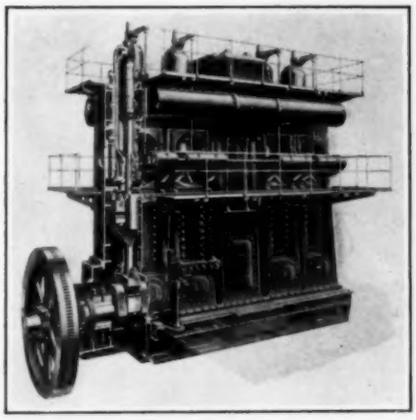
Installation of the Gilbert Fuel System for Varnish Fires at the Briggs-Maroney Co., Inc., Everett, Mass., Made by the Graff Engineering Co., 150 Nassau St., New York

Perhaps of all this commendable activity the one thing with the most promise for the future of the material handling industry was the tremendous improvement made in belt conveyors during the year. Due to the courage and progressiveness of the H. C. Frick Coke Co., belt conveyor manufacturers were given the opportunity of redesigning their equipment to serve in a series of conveyors 4¼ miles in total length to be used for handling coal continuously over 10-hour periods each day. In order to make such a conveyor system feasible it is obvious that attendance, power consumption and maintenance costs must be reduced to the absolute minimum. The prominent manufacturers all worked on this problem, and as a result many strides forward in the art of belt conveying were made.

In this connection several new designs of belt conveyor idlers were brought out that well illustrate the progress made. The Robins Conveying Belt Co., New York, introduced a three-roller troughing idler with Hyatt roller bearings and high-pressure lubrication. The Stearns Conveyor Co., Cleveland, Ohio, brought out a five-pulley troughing idler equipped with Timken roller bearings and high-pressure lubrication. The Stephens-Adamson Manufacturing Co., Aurora, Ill., designed a three-pulley troughing idler with S. R. B. annular ball bearings and Alemite high-pressure lubrication. These are only examples of what most of the manufacturers making this type of equipment have done. They serve well to illustrate the endeavors that are being made to increase the reliability of conveying equipment and to reduce the amount of attendance and maintenance necessary as well as the power requirements.

Throughout all industry there is an active trend toward the automatic control of operations. The activity along this line in the chemical and other process industries is but one phase of a very large movement,

Developments in the Equipment Field



Two-Cycle, Double-Acting Diesel Engine Made by the Worthington Pump & Machinery Corporation, Harrison, N. J., Showing One Cylinder Cut Away to Expose Working Parts

hence many of the devices developed that are of use in this field were not designed particularly for the field. This makes it necessary for the wise production man in the chemical engineering industry to keep abreast of all the developments in control instruments, not merely those that are particularly directed at his specialty, if he is going to profit by the progress that is continually being made.

During 1924 *Chem. & Met.* noted twenty-six important improvements in control devices. These were but a fraction of the total made, but space would not permit of each new thing being adequately treated, so efforts were confined to noting at length those that seemed most germane to *Chem. & Met. s* field. Such controlling factors in processing as temperature, pressure, rate of fluid flow, specific gravity, rate of material feed, speed of operation and many others all received their meed of attention from the various manufacturers and undoubtedly, when enough time has passed so that some perspective on the results of 1924's activities is attained, it will be evident that much real progress has been made.

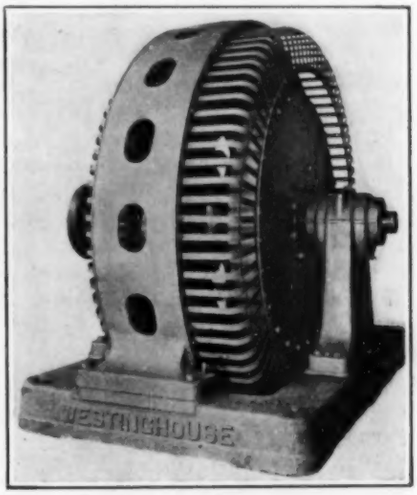
To illustrate the course that has been taken in developing controlling devices, two examples will serve. For use with heating equipment using steam as a heating medium or working over a similar range of temperature, the Files Temperature Control Co., Bridgeport, Conn., brought out a temperature controller that is at the same time sturdy and close in control. This device consists of two parts, inlet valve and control unit. There is a pilot valve, operated by a strong thermocouple made of a high- and low-temperature metal laminated together and in the shape of a ribbon spring. The opening and closing of the inlet valve is controlled by this pilot valve. The thermocouple is operated by the temperature of the fluid that it is desired to control. This new design is actuated by the heating fluid and requires no auxiliaries of any kind, illustrating a trend toward simplicity and durability.

For high-temperature heating process control, where a pyrometer is required to measure the temperature, an automatic temperature control has been devised by the Wilson-Maeulen Co., Inc., 383 Concord Ave., New York. This control is made in units, each to operate one piece of heating equipment. The units are so designed that any number up to six can be operated from one ¼-hp. motor, thus centralizing control. Each unit is actuated by a thermocouple circuit, and as the temperature and hence the current in this circuit vary, it operates, through a second circuit, the control valve on the fuel supply to the heating furnace. The control is designed to keep the temperature even, within close limits, at a predetermined level.

Progress in the Electrical Field

During the year a new motor, particularly designed for use in such industries as cement, rubber and paper, was developed by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. It is for use in drives where the characteristics of the synchronous motor are desirable and where high starting torque with low starting current is essential. It is a combination of a standard synchronous motor with a standard magnetic clutch. This permits the motor to start heavy loads with starting torque available up to the pull-out torque of the motor.

In connection with drives for rubber mills, this same company has improved the drive brought out 2 years ago by developing a three-pole, double-throw, gravity-operated contactor that makes it possible to use dynamic braking with either automatic or manual starter, the braking feature being independent of any external control circuit or relay



Schematic Section of Vacuum Drum Drier, Showing Projection Roll and Liquid Reservoir Beneath

operation. This is said to give a reliability comparable to the direct current drive for calenders that has been in use for many years.

The Westinghouse company has also done much work on electric paper driers. This is a radical departure from ordinary paper mill practice, but is said to have great possibilities for plants having a low power cost.

Among the many developments made by the General Electric Co., Schenectady, N. Y., most were in the line of a carrying forward of improvements started in the past, a general movement looking toward the completion and perfection of the different lines of equipment made by this concern. For instance, the principle of operation developed for the electrically operated flowmeter was extended to the operation of a variety of other instruments, such as vacuum gages and water level indicators for tanks under steam pressure. Single phase adjustable varying speed motors with a 2½ to 1 speed range with constant torque load, for hand or remote control, were developed. A single phase repulsion induction motor, reversing from full speed in one direction to full speed in the other, for crane and hoist service, was developed. Special induction motors of the inclosed, ventilated type were designed for operation in an atmosphere of acetone. Improvements in direct current motors for operation where there are fumes of gasoline, ether, etc., were also made.

Reinforced concrete and brick factory of the Monroe Drug Co., Quincy, Ill., for the Manufacture of Household Dyes. Designed by Lockwood, Greene & Co., Engineers.

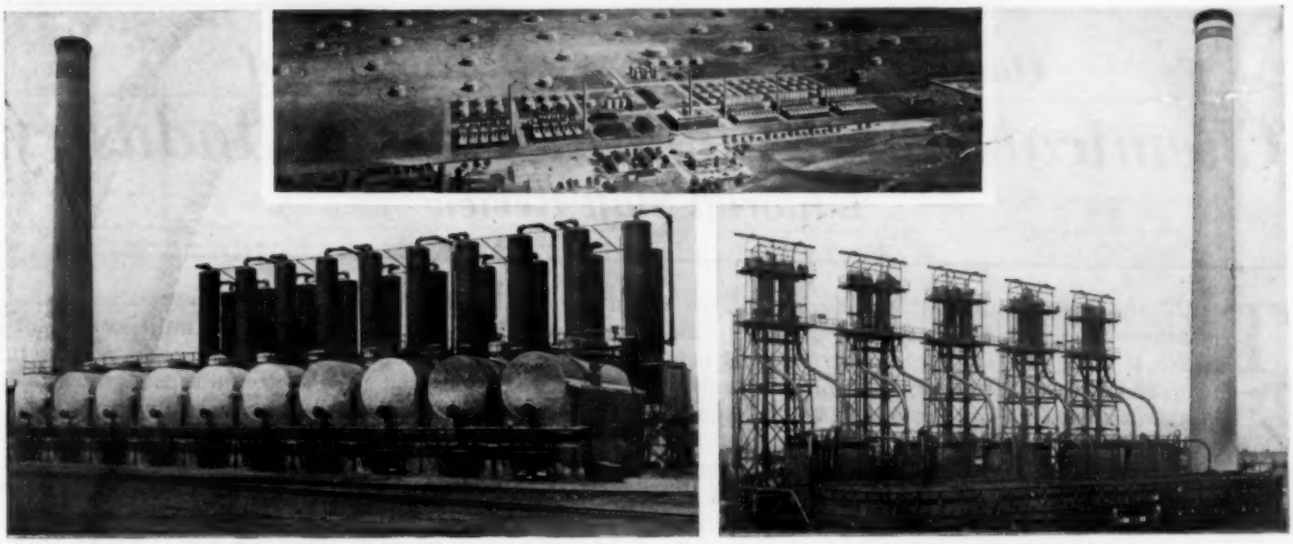
Plant Construction in 1924

IN VIEW of the tremendous volume of building construction during the past year in many fields, the progress made in the chemical engineering industries does not seem great. The legacy of over-housing left to these industries from the war has, in many directions, not yet been absorbed. However, in special fields where the expansion was great, such as in petroleum refining, and in others where the former plants were of a temporary or unsuitable character and needed replacing, real progress was made. In all lines, the tendency to adopt the favored construction materials of other fields, reinforced concrete, tile, steel sash and wire glass, was marked, and it seems probable that, for 1925 at least, all the permanent construction, outside of special cases where plant conditions demand other materials, will follow this trend.

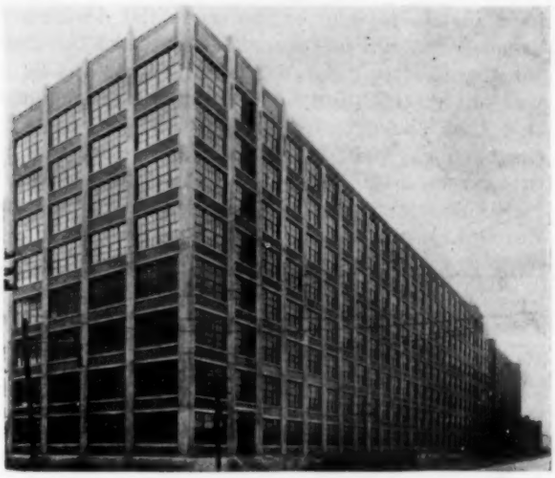
(Upper) Reinforced concrete refinery of the Texas Sugar Refining Co., Texas City, Tex., designed by Edward T. Eastwick.

(Lower) Part of the steel truss and tile factory of the American Cellulose & Chemical Mfg. Co., Cumberland, Md., designed and erected by the Austin Co.

(Right) Plate glass factory of the Ford Motor Co., River Rouge, Detroit, Mich., with walls entirely of wire glass in steel sash.

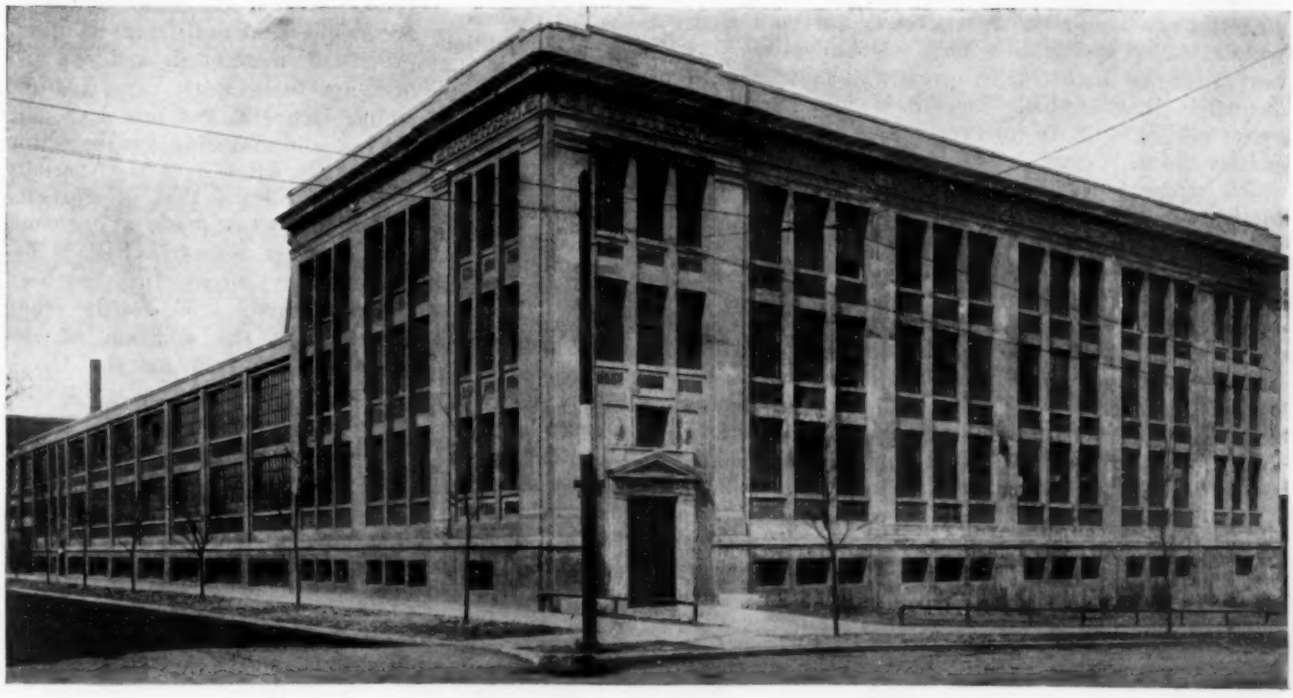


(Above) Three views of the Producers & Refiners Corp. Oil Refinery at Parco, Wyo. Airplane view of plant; left, the tower stills; right, Dubbs cracking stills. Designed and erected by the J. G. White Engineering Corp.



(Right) Reinforced concrete manufacturing building of the Victor Talking Machine Co., Camden, N. J., where, among other things, great quantities of talking machine records are made by a chemical engineering process. Designed and erected by Stone & Webster, Inc.

(Lower) Reinforced concrete plant for the manufacture and bottling of beverages, at Chicago, Ill. Designed for the Coca-Cola Co., by Lockwood, Greene & Co., Engineers.



Quantitative Data on the Distribution of Chemicals, the Raw Materials of Industry

Editorial Staff Review

THAT the consumption of sulphuric acid is a measure of the industrial development of any nation is axiomatic—particularly to technical men. The thought is instilled into every student of chemistry and is constantly brought home to him in his subsequent contact with the industries. Furthermore, as his horizon broadens with experience, the technical man is impressed by the fact that not only sulphuric acid but dozens of other chemicals are so intimately woven into the industrial fabric of the nation as to be generally recognized as business barometers.

But these are generalities—sufficiently accurate perhaps for the layman or the economist desiring only the broad industrial picture. The cry from the industry is for quantitative data—for definite facts and figures that will put distribution on the same rock-bottom foundation that characterizes production and operation. In the chemical industry a creditable start was made in this direction 20 years ago by Dr. Charles E. Munroe in his classic studies of the censuses of 1900 and 1905. But it was not until 1917 that the subject was revived in earnest by the War Industries Board when laying out a logical industrial program for military production. Except for minor contributions from certain trade associations and some scattered consumption data collected by the Census and other government bureaus, the quantitative study of the distribution of chemicals was allowed to lapse after the war. Last year in its first Annual Review Number, *Chem. & Met.* published some carefully studied estimates of the distribution of a number of important chemicals according to their consuming industries. As the census data on production has gradually become available, it has been necessary to make minor revisions in some of the figures, although in the main the estimates have proved substantially well founded. With this background of experience and assisted by the co-operation of a number of producers and consumers, *Chem. & Met.* has extended the list of commodities to include more than a dozen additional articles of wide distribution in industry. These studies are presented in tables and charts on the following pages.

67 Million Gallons Per Year

That Was the 1924 Production of Denatured Alcohol, the Raw Material for 1,000 Industries

NO ONE appreciates the truth of the foregoing statement more than those in the chemical engineering industries for whose processes industrial alcohol is an essential raw material. It has been truly said that water is the only solvent used in industry in greater quantities than alcohol. Thus it is extremely difficult to picture adequately the wide diversity of uses in which this basic material finds application.

A few of these uses, however, which even the technical man is not likely to appreciate in their true quantitative importance were reviewed by B. R. Tunison on Jan. 9, 1925, in an address before the intersectional meeting of the Northeastern, Rhode Island and Connecticut Valley sections of the American Chemical Society. He pointed to a survey just completed by the Treasury Department which shows that the motor vehicles of this country annually require more than 28,000,000 gal. of alcohol merely to prevent the freezing of water in radiators. Last year 10,000,000 gal. was used for perfumes, toilet preparations, lotions, barbers' supplies, etc. Ethyl acetate, made from alcohol at the rate of more than half a million gallons a month, is used in increasing quantities in the nitrocellulose industries. A third of a million gallons was used last year in the manufacture of shaving creams. Three-quarters of a million gallons was required merely to precipitate the pectin that the food industry and the housewives of the country use in jellying fruit juices. The tobacco industry used nearly a million gallons in the manufacture of cigars and cigarettes. Synthetic phenolic resins and the many products made therefrom involve the consumption of approximately a million gallons of alcohol annually. Pyroxylin lacquers, artificial silk, spirit varnishes, coated fabrics—the list could be extended almost indefinitely, but perhaps the situation might better be reviewed from the official figures of the recent annual report of the Commissioner of Internal Revenue for the fiscal year ended June 30, 1924. The classification therein is for completely and specially denatured alcohols and the distribution by formulas is that shown in the accompanying chart.

Completely denatured alcohol is ethyl alcohol that has been rendered entirely unfit for beverage purposes and may be handled by the public without a permit or the filing of a bond. Among its significant uses are included the anti-freeze solutions previously mentioned, and the use in motor fuels, spirit varnishes and stains, lacquers, gas mantles, solid alcohol, and cleansing and polishing compounds. But it is the specially denatured alcohol that is most interesting as a raw material in chemical and other industries. It is defined as ethyl alcohol that has been rendered partly unfit for beverage purposes by the addition of denaturants approved by the U. S. Internal Revenue Bureau. Such alcohol must be used only as specifically authorized and under government permit and approved bond. During the 1924 fiscal year 33,000,000 gal. were sold for industrial purposes. To attempt to catalog the several thousand separate uses to which this material was applied is obviously impossible here. The accompanying chart and table are in-

Industrial Chemicals in 1924

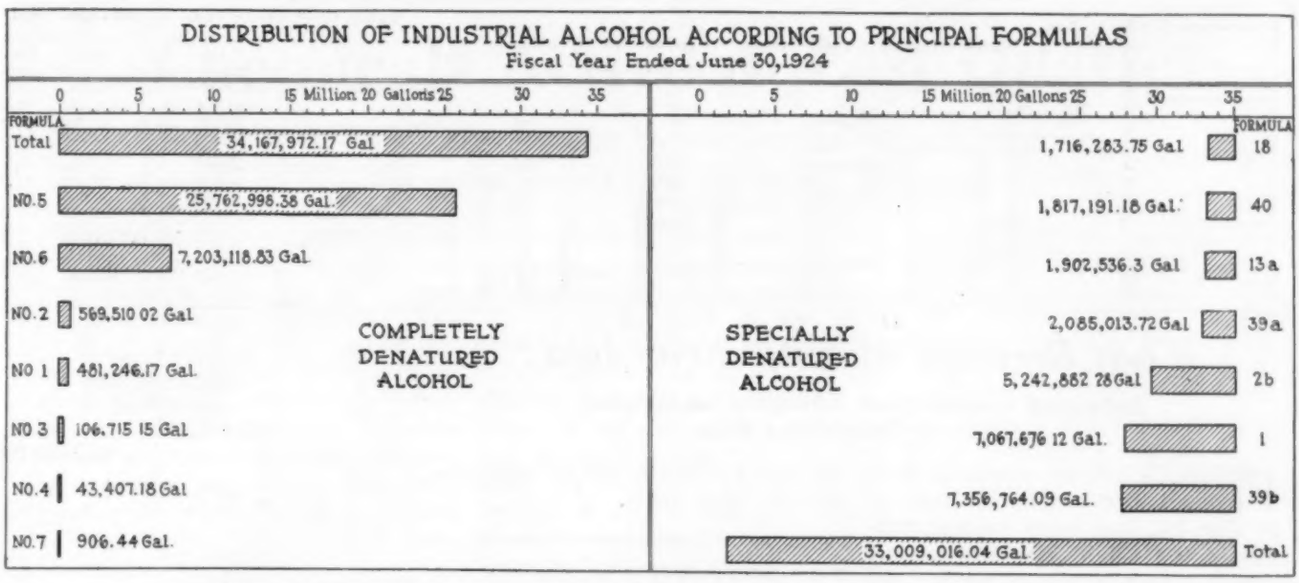


Table I—Some of the Uses for Specially Denatured Alcohol Classified According to Formulas

No. 1. (100 gal. ethyl alcohol and 5 gal. methanol.)	
Aldehydes Acetaldehyde Bensaldehyde, etc. Artificial leather Aspirin Coumarin Drugs and medicinals (Est. use in more than 5000 products)	Ethers and esters Ether Ethyl acetate Lacquers Nitrocellulose Perfumes, synthetic Photographic films Tobacco Varnish removers

No. 2b. (100 gal. ethyl alcohol and ½ gal. benzol.)	
Arsphenamine Dyestuffs Ethyl esters Motor fuels Pyroxylin plastics	Smokeless powder Sulphuric ether Saccharine Trinitrotoluol

No. 13a. (100 gal. ethyl alcohol and 10 gal. ether.)	
Anesthetic ether Certified food colors Collodion Photo engravings	Protargentum Salvarsan U.S.P. medicinals

No. 18. (100 gal. ethyl alcohol and 100 gal. vinegar.)	
Acetate of lime Acetone	White vinegar

No. 39b. (100 gal. ethyl alcohol and 2½ gal diethylphthalate and ½ gal. benzol.)	
Rubbing alcohols	Liniments

No. 39a. (100 gal. ethyl alcohol and 1 gal. acetone or isopropyl alcohol and 60 oz. approved alkaloids.)
Alcoholic barber preparations Hair tonics Rubbing alcohols (must contain about 0.3% benzol) Liniments

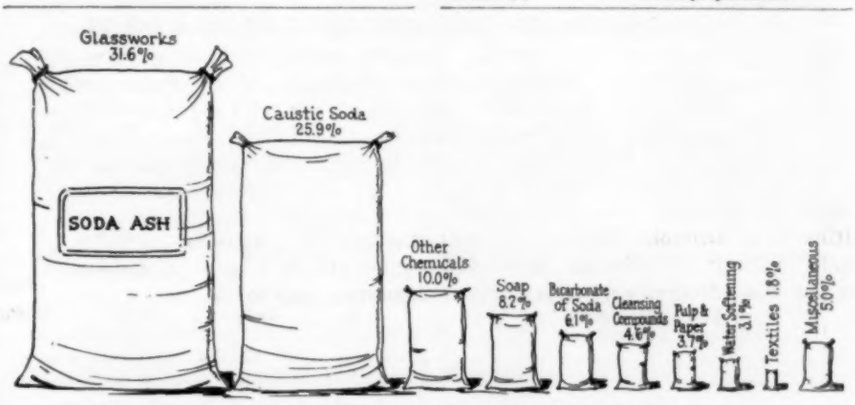
No. 40. (100 gal. ethyl alcohol and 3 oz. brucine sulphate and ½ gal. acetone U.S.P. or isopropyl alcohol.	
Perfumery	Toilet preparations

tended to show some of the principal industrial applications classified according to the seven most important formulas. In all, the Commissioner's report shows distribution among 81 formulas and it is significant that the list is constantly being extended.

Alkalis in 1924

What Industries Consumed Caustic Soda and Soda Ash

AMONG chemicals soda ash is second only to sulphuric acid in the tonnage of its production, yet practically nothing of a quantitative nature has ever been published regarding its consumption by the industries. To be sure, the Census of Manufactures has at times shown soda consumption for glassworks and paper mills, but there has been an evident confusion between soda ash and caustic soda in the method of reporting and the totals are not always trustworthy. However, by the use of estimates of trade leaders checked against indexes of activity in the consuming industries it has been possible to arrive at results that give a fairly accurate picture of the disposition made of the soda ash produced last year. These estimates will be found in Table I.



Where 1,600,000 Tons of Soda Ash Went in 1924

Table I—Estimated Distribution of Soda Ash by Industries in 1924

Industry	Tons Consumed	Per Cent of Total
Glassworks	510,000	31.6
Caustic soda	417,000	25.9
Other chemicals	160,000	10.0
Soap	130,000	8.2
Bicarbonate of soda	99,000	6.1
Cleansing compounds	75,000	4.6
Pulp and paper	60,000	3.7
Water softening	50,000	3.1
Textiles	30,000	1.8
Miscellaneous and stocks	80,000	5.0
Total	1,611,000	100.0

A slightly different situation obtains as regards caustic soda statistics, for in 1917 the War Industries Board published its data on the war-time consumption of this important commodity. These figures were adjusted to a peace-time basis last year in *Chem. & Met.* and are now presented in Table II in slightly revised form together with the estimates made for 1924.

Industrial Chemicals in 1924

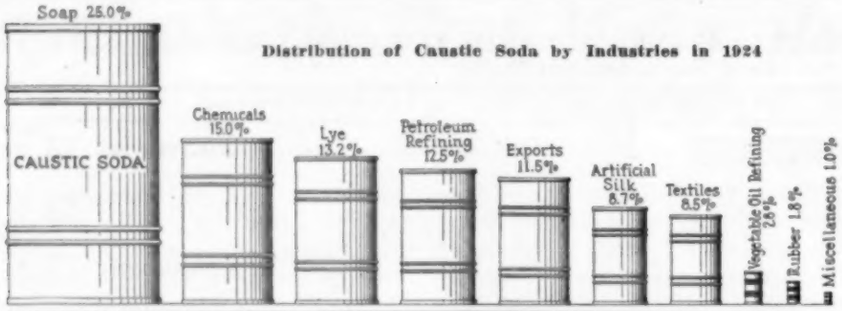


Table II—Caustic Soda in 1923 and 1924

Industry	1923 Tons Consumed	1923 Per Cent of Total	1924 Tons Consumed	1924 Per Cent of Total
Soap	105,000	24.1	100,000	25.0
Chemicals	70,000	16.0	60,000	15.0
Lye	55,000	12.6	53,000	13.2
Artificial silk	40,000	9.2	35,000	8.7
Other textiles	40,000	9.2	34,000	8.5
Petroleum ref.	40,000	9.2	50,000	12.5
Veg. oil ref.	12,000	2.7	11,000	2.8
Rubber working	8,000	1.8	7,000	1.8
Miscellaneous	9,000	2.1	4,000	1.0
Exports	57,000	13.1	46,000	11.5
Total	436,000	100.0	400,000	100.0

What Becomes of Sulphuric Acid?

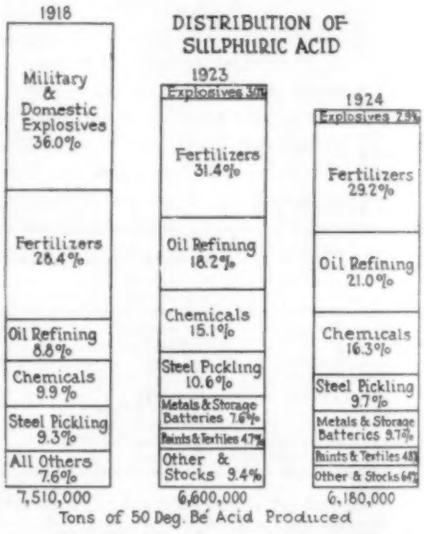
Industrial Consumption Changing as Industry Settles to Peace-Time Basis

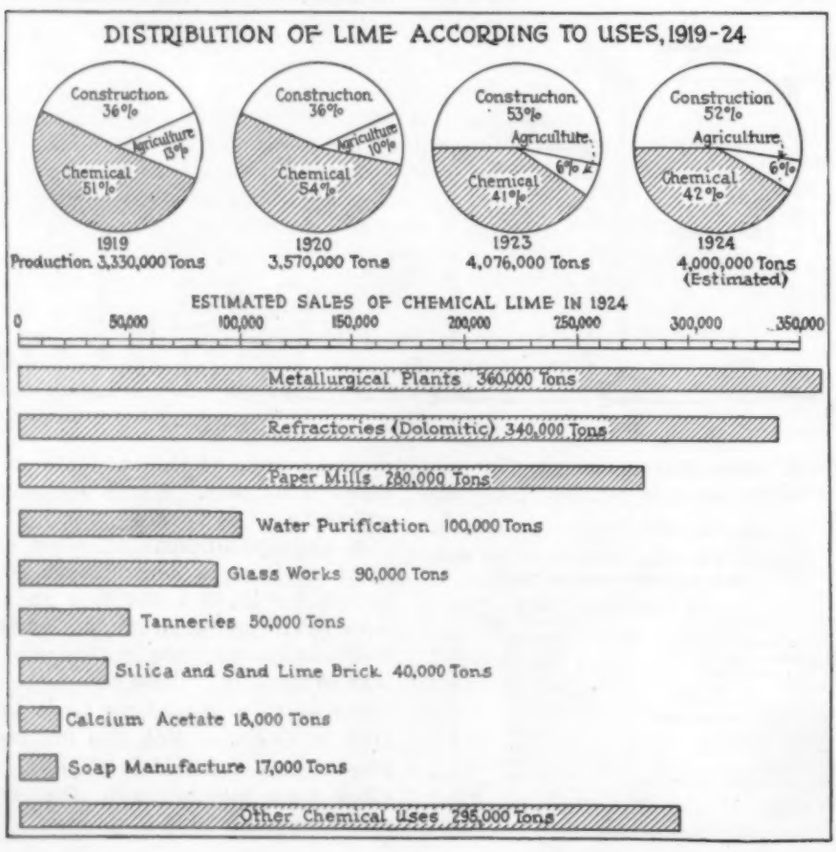
PRODUCTION of sulphuric acid, reduced to a comparable basis of 50 deg. Bé., has lately been averaging in the neighborhood of a half million tons a month. This is a decline from the total of 7,500,000 tons produced during 1918, but a consideration of the accompanying table and chart shows that when war-time production of munitions is eliminated, industrial consumption of sulphuric acid has actually shown a substantial growth since 1918. Oil refining, chemical production and the manufacture of storage batteries are three industries showing the greatest increase in the use of sulphuric acid in recent years.

Estimated Distribution of Sulphuric Acid by Industries, 1918-24

(In tons of 50 deg. Bé. Acid)

Industry	1918	1923	1924
Explosives	2,700,000	200,000	180,000
Fertilizers	2,130,000	2,070,000	1,800,000
Oil refining	671,000	1,200,000	1,300,000
Chemicals	740,000	1,000,000	1,000,000
Steel pickling and galvanising	700,000	700,000	600,000
Textiles	100,000	112,000	100,000
Paints and pigments	104,000	198,000	200,000
Metals and storage batteries	292,000	500,000	600,000
Miscellaneous	73,000	620,000	400,000
Total	7,500,000	6,600,000	6,180,000





Lime, the Raw Material

Second Only to Construction Are the Industrial Uses for Chemical Lime

LIME is of so common occurrence that we easily lose sight of the fact that it is one of the most widely used and basically important chemicals. Last year it is estimated that the industries of the country absorbed 1,680,000 tons of chemical lime. This is slightly under the totals for 1920 and 1923 and practically the same as the 1919 figure. During this period there has been a substantial increase in the use of lime by the construction industry, while agriculture has taken a decreasing portion. The decrease in percentage is practically counterbalanced by the increase in production.

It is possible in the accompanying chart to list only the most important of the hundreds of uses for chemical lime and the reader desiring additional data is referred to the bulletins of the Geological Survey and to the comprehensive survey of the uses of lime by M. E. Holmes, published in *Chem. & Met.*, Feb. 15, 1922, pp. 294-300.

Industrial Chemicals in 1924

Chemicals Active in Last Quarter

Quiet Early Trading Succeeded by Large Buying Movement and Heavy Contract Placements

THE majority of industries that are consumers of chemical products operated on a conservative scale for the greater part of last year and the output of chemicals was slightly less than in 1923. Manufacturers of heavy chemicals entered the year with contract orders on hand in sufficient volume to assure a large outlet for their goods. Buying for additional needs varied according to the state of general business, but was at its lowest ebb in the late spring and early summer months when manufacturers of finished products had reduced plant operations and were drawing more heavily on surplus stocks. As these manufacturers were not overstocked with raw materials, their policy of working off accumulations of finished products brought about a healthier economic condition in their industries.

Foreign trade in chemicals proceeded along usual lines. Official returns have not been compiled for the 12-month period, but based on the statistics available, export shipments declined about 8 per cent as compared with those of 1923. Owing to the lower unit values prevailing for some chemicals, it is probable that the decline was less in volume than in value. Importations of chemicals and allied products showed practically no change in value from the preceding year, but chemicals alone were valued at close to 10 per cent below the 1923 totals and, with the exception of coal-tar chemicals, domestic consumption of imported chemicals was along reduced lines.

In the last quarter of the year this condition reacted in favor of the chemical industry inasmuch as improvement in general business lines found producers working on small stocks of raw materials and relatively light supplies of finished products. In addition to increased call for spot and shipments, active buying of chemicals for 1925 was encountered and the year closed with the outlook favoring an increase in production and distribution of chemicals during 1925.

Market prices had started on a downward course early in 1923 and this tendency was unchecked throughout the greater part of last year. Lower production costs were factors in the deflation of values and the influence of trading activity was apparent in the close accord of prices and consuming demand. In the latter part of the period buying reached an active stage and selling schedules were quick to respond. *Chem. & Met.'s* weighted index number, published weekly, reveals that average prices at all times were under those in effect in 1923 and also shows that the curve was of upward tendency at the close of the year.

Steady Position of Alkalis

There was some price cutting in the alkali trade, and export business in caustic soda covered a wide range in price. Nevertheless the alkali markets, generally considered, held a steady position. In the first place, bleaching powder presented a sharp constrast to conditions that obtained in the preceding year. Prices were advanced on three different occasions in the first quarter of the year and the higher levels were maintained over the remainder of the year, including the hot weather period, when in past years selling pressure has been heaviest. Caustic soda and soda ash held at unchanged price levels as far as first hands were concerned and contract prices for 1925 as announced in November were the same as had prevailed throughout 1924 and gave further proof of the stability of market values.

Oversupply of Arsenic

Encouraged by reports that calcium arsenate consumption would be larger than ever before, producers of arsenic took steps to increase their output in 1925 and official figures report a record production for the year. The supply was further increased by heavy arrivals of foreign-made arsenic and, with the prospective outlet falling far short of realization, there was a preponderance of stocks and a drastic fall in values. This not only resulted in a slowing up in trading in the latter part of the year but also had a deterrent effect on production, which may be felt in 1925. The carryover of arsenic either as such or in the form of calcium arsenate was large enough to take care of a large part of consuming needs for 1925 unless the latter show remarkable expansion. Incidentally, manufacturers of insecticides have learned that weather conditions are important guides to probable ravages of the boll weevil and the experience gained last season already has led to the formation of plans for stabilizing the industry.

Influence of Higher Tariffs

As a result of investigations by representatives of the Tariff Commission, higher import duties were established for nitrite of soda and oxalic acid. In the case of the latter the proclamation of the President was not issued until late in December. Although the increased duty did not become operative for 30 days, it had an immediate effect on market activities and values. Consuming industries realized that higher selling prices were inevitable and buying orders flooded the market. Speculative inquiry also was stimulated, but sellers adopted a policy of restricting offerings and the market closed with no definite readjustment to the changed conditions. The additional cost of importing nitrite of soda, however, extended over the last half of the year and had a decided trend toward increased home production and a more or less proportionate decline in arrivals from foreign markets. Prior to the announcement of an increase in duty, domestic production had been practically at a standstill, but this condition soon was changed and indications point to a wide expansion in the home output during the coming year.

French-German Potash Combine

Among the important developments of the year, because of its effect on sources of supply for American industries, was the agreement formulated on Aug. 14 by leading producers of potash in Alsace

Industrial Chemicals in 1924

and Germany. This agreement, which is to continue for 3 years, extends to fixation of prices and allocates the amounts to be shipped to the United States. It is tantamount to a return to former conditions when production was entirely under German control and has deprived domestic producers of the opportunity of buying on a competitive basis. It is believed that under such market control, prices for potash cannot be expected to decline, and a stimulus has been given to efforts to develop substitutes or new sources of supply. In the latter part of the year it was reported that potash production in Spain had made such headway that exports would begin to move early in 1925.

Higher Prices for Vegetable Oils

Shortage in World Market for Fatstuffs Starts Wave of Buying in Fall

THERE was a marked change for the better in the position of the market for vegetable oils in 1924. Early in the year conditions pointed to nothing extraordinary, and business was conducted in a routine way with prices unsettled and tending lower. But in the summer months unfavorable crop news from sections in this country and in Europe made it apparent that yields of cereals and fodder would be reduced. This changed the complexion of the market and subsequent activity on the part of consumers and speculators brought about a higher trading basis for grains, hog products and oilseeds. Before the close of the year the entire vegetable oil group shared in the uplift in prices.

Production of corn in 1924 was reduced to the extent of 617,395,000 bu., the crop amounting to 2,436,000,000 bu., as against 3,053,395,000 bu. in 1923 and 2,890,712,000 bu. in 1922. The position of the market for corn is of great importance to the vegetable oil industry, for this commodity controls the course of prices for animal fats, chiefly pure lard. Lard, in turn, establishes values for cottonseed oil products. There was a healthy gain in production of cotton and its by-product cotton seed, but traders took the stand that the larger potential supply of oil from the 1924 crop would hardly make up for the impending deficit in the lard supply. The year also witnessed a substantial gain in domestic production of flaxseed, the increase amounting to 90 per cent, but this failed to weaken prices, because of the absorption of the Argentine surplus by Europe. The outlook for the 1924-25 crop in the South American flax belt was unfavorable and this added strength to the situation.

Early in the year prices for most of the vegetable oils were reasonably low, but not so low as to induce heavy contracting by consumers against future requirements. The business situation was not encouraging and buyers operated cautiously, restricting purchases to nearby wants only. Supply and demand just about balanced. Consumers were influenced by large preliminary acreage reports and sentiment favored a lower level of prices for virtually all commodities.

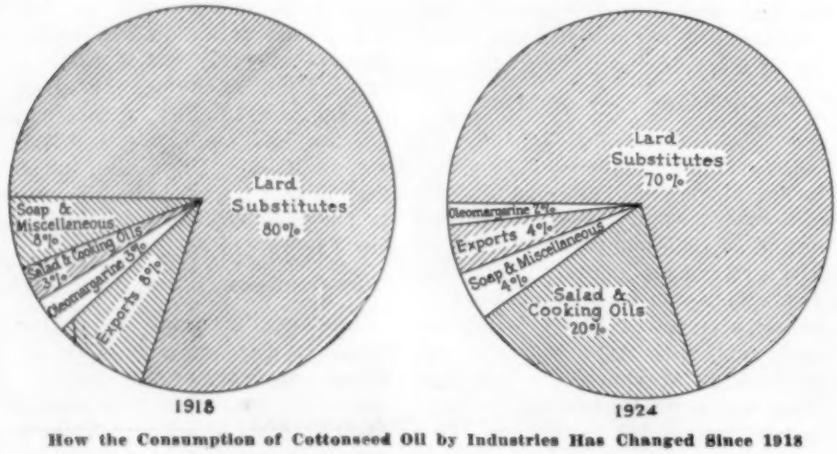
The entire situation changed before the close of July and the unfavorable crop developments led to a gradual tightening up in prices. The upturn spread to oils and fats, but the most important gains were made in the fall, when speculative activity took on sizable proportions.

Consumption of the two basic vegetable oils in this country, covering the crop year periods, did not alter appreciably from the totals established in 1923. Distribution of refined cottonseed oil for the year ended July 31, 1924, amounted to 2,237,000 bbl., which compares with 2,340,000 bbl. in 1923. Consumption of linseed oil in the crop year ended Aug. 31, 1924, was estimated at 1,500,000 bbl., which compares with 1,600,000 bbl. in the corresponding period a year ago.

Stocks of both cottonseed and linseed oil were below normal throughout the year and this created a firm market for spot material. In the case of linseed oil crushers did not care to "speculate" in the seed markets and accumulate supplies, owing to the uncertainty regarding the future. Spot holdings of linseed oil were so small at times that several crushers had to defer making deliveries. Imported linseed oil did not figure largely in the year's trading, the high duty restricting business.

The volume of business in coconut oil was slightly larger than in the preceding year. Actual imports of copra were smaller, but this was offset by a gain in imports of the oil. As in other raw materials Europe entered the market for copra on a larger scale and this forced prices higher. European crushers were in a position to outbid American buyers because of the more favorable position of the foreign cake market and generally lower production costs.

Some progress was made in development work in connection with domestic production of tung nuts, the material from which chinawood oil is made. Tung trees have been planted in sections of Florida in an experimental way and high hopes are entertained for the future. The importations of chinawood oil were



How the Consumption of Cottonseed Oil by Industries Has Changed Since 1918

Industrial Chemicals in 1924

smaller than in 1923, reflecting a moderate reduction in consuming demand. The tremendous growth in the use of pyroxylin lacquers in fields formerly occupied exclusively by chinawood oil varnishes did cause some concern in trading circles and it was felt that this development, in time, might influence the status of chinawood oil. Soya-bean oil importations from the Orient were even smaller than in 1923, the tariff being instrumental in restricting business. Production of soya-bean oil from domestic seed was restricted to just a few carloads. Soap makers were large consumers of palm oils, yet the total quantity imported was not up to the high mark of a year ago. Progress was reported in consumption of the ordinary grades of African palm oil in the edible field from the United Kingdom and on the Continent, but there was no particular need for an edible oil of this class in this country. The cost of refining palm oils is higher than the cost of refining cottonseed oil. Palm oil is used extensively in the soap industry as a substitute for tallow.

Advancing prices did not restrict trading in rapeseed oil, lubricating oil manufacturers absorbing slightly more than in 1923. Early in the year it was reported that refiners bought several round lots of sesame oil in foreign markets, and while there was a gain in the movement of this material into the United States, the total quantity imported was less than 20,000 bbl. Soap makers consumed more sulphur oil, better known as olive oil foots, and a feature in the year's developments was the transfer of this commodity in bulk direct from Italy. There was a shortage in production of castor beans, which resulted in very much higher prices. Castor oil was in scanty supply here in the last quarter of the year and prices were abnormally high. Peanut oil importations increased, despite the tariff, but the total imported was far below the 1921 basis.

The tallow situation attracted widespread interest toward the close of the year, prices advancing sharply on heavy buying by soapmakers. A revival in demand for soaps occurred in the fall months and the buying took on larger proportions than producers had calculated. This activity forced additional purchase of tallow at a substantial increase in cost. The quantity of whale oil imported in the 11 months ended Nov. 30 was officially reported at 4,945,301 gal. Production of menhaden oil was 60 per cent below the 1923 output. Poor fishing accounts for the decline in production.

Coal-Tar Output Steadies in 1924

Producers Have Normal Year, but Balanced Market for Refined Products Is Needed

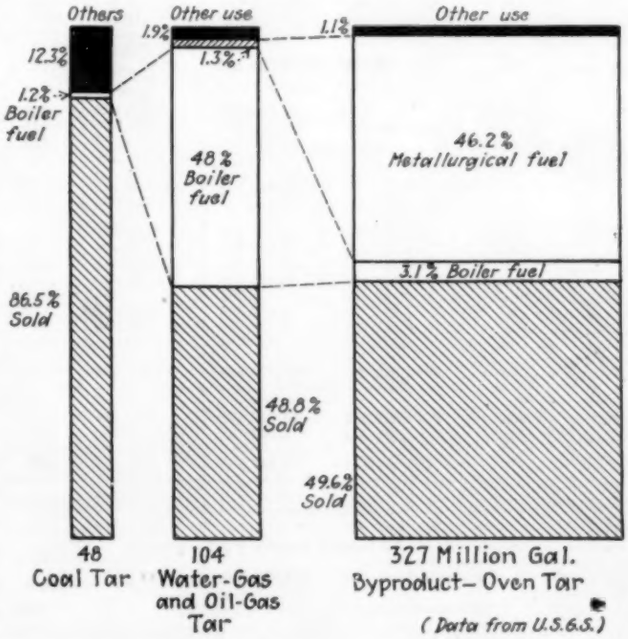
THE estimated production of byproduct oven tar in 1924 was a trifle less than 90 per cent of the production in 1923, but about 10 per cent greater than in any other preceding year. The production of retort coal-gas tar is estimated at approximately the same as in other recent years. But the output of water-gas tar and oil-gas tar appears to be slightly decreasing from year to year despite the increase in output of these kinds of gas. The decrease in production of water-gas tar and oil-gas tar is apparently the result of changing methods of plant operation that are possible with the lower heating-value standards now in force and as a result of improved methods of water-gas machine operation. Table I gives the statistics for tar production in the United States for several recent years, in so far as statistics are available.

The figure below shows the distribution of tar made by various processes as reported to the U. S. Geological Survey for the calendar year 1922. There is nothing in the industrial situation to indicate that there has been any marked change in the percentage of the various kinds of tar applied to the purposes shown in this diagram. The general belief that very much less tar is being burned for fuel now than formerly is probably based upon the fact that more tar is being refined, but the fact seems to be that the rate of tar production for the country as a whole has increased more rapidly than has the demand for tar for refining. Hence the percentage burned

Table I—Tar Production in the United States

(Millions of Gallons)
(Data from U. S. Geological Survey)

Year	Retort Tar	Water-Gas, and Oil-Gas Tar	Byproduct Oven Tar
1918	53	101	263
1919	...	...	289
1920	51	116	361
1921	...	...	253
1922	48	104	327
1923	...	...	441
1924 (estimated)	50	100	395



What Happens to Coal Tar?

The Geological Survey furnishes the data for this picture of the disposition of the tar produced in 1922. The situation has changed little since then. The proportion used for fuel purposes is a matter of special interest.

Industrial Chemicals in 1924

by the producing company is today not materially different than in previous years.

Tar Prices Nominal

The prices realized for tar sold by coke-oven producers in 1923, the latest year for which statistics are available, show that there is a general trend toward higher market prices. But this trend is decidedly obscured by the fact that the by-product ovens owned by metallurgical companies operating steel plants are in the majority and these oven plants usually transfer their tar at a nominal price to the metallurgical department, where it is used for fuel. Since the majority of the plants which make 80 per cent of the tar usually do not sell this tar, the average price reported to the government by all companies includes many returns that are simply the bookkeeping value assigned to the material for the purpose of interdepartmental records.

The value assigned to the tar, and even the value at which it is sold, often depend upon the fuel value for steam raising. Hence there is wide variation in price throughout the country, depending upon local coal prices, which variation continued in 1924, as during previous years. There is no such thing as a "spot" market for tar. The sale by producers is usually on long-time contracts, but smaller quantities are frequently sold for special purposes, at prices that depend more or less upon "what the traffic will bear" or upon the extent to which the producer finds prompt tar disposal an easy or a difficult problem. The fact that tar production is usually low at the same time when the user demand for metallurgical furnace fuel is low makes wide fluctuation in tar price in any particular locality extremely unlikely.

Table II—Production of Coal-Tar Crudes 1923 by Firms Not Primarily Engaged in the Operation of Coke-Oven Plants and Gas Houses

(Data from U. S. Tariff Commission)

	Quantity	Value	Value per Unit
Benzene, gal.	394,906	$118,505	$0.300
Naphthalene (crude), lb.	41,453,003	652,148	.016
Solvent naphtha, gal.	501,754	142,122	.283
Dead or creosote oil, gal.	38,636,974	4,266,785	.110
Pitch of tar, tons	675,628	9,684,547	14.334
Other distillates, gal.	14,801,569	1,941,495	.131
Refined tar, bbl.	1,675,213	5,944,085	3.548

Note—The instructions sent to manufacturers were as follows: Include under dead or creosote oil only products which may be used for creosoting. Include under other distillates shingle stain oils, disinfectant oils, and flotation oils which do not contain more than 5 per cent of phenol. Include under refined tars those tars which are used for road treatment, saturating felt and for protective coatings.

The principal products of tar refining as reported to the U. S. Tariff Commission for the calendar year 1923 are given in Table II, prepared by Dr. W. N. Watson of the Chemical Division of the U. S. Tariff Commission as a part of the "Census of Dyes and Other Synthetic Organic Chemicals, 1923." Market conditions in the various coal-tar products industries are discussed elsewhere in this issue. Here it is only necessary to emphasize the point that further increase in distillation of tar depends more upon proper balancing of the markets for the various primary tar products than upon any other single industrial factor. Further supplies of raw tar are adequate for great expansion of the tar-refining business.

Table III—Coal Products Prices in 1924

	Ammonium Sulphate, Bulk, Works, Per Lb., Cents	Benzene, 90% Tanks, Works, Per Gal., Cents	Toluene, Tank Cars, Works, Per Gal., Cents	Solvent Naphtha (Crude) Tanks, Works, Per Gal., Cents
Jan.-Mar.	2.85–3.00	21–23	24–26	20–22
Apr.-June	2.50–2.85	23	26	22
July-Sept.	2.40–2.75	23	26	21–22
Oct.-Dec.	2.65–2.75	23	26	21–22
Maximum	3.00	23	26	22
Minimum	2.40	21	24	21
Average	2.70	23	26	21½

Table IV—Byproducts Obtained From Coke-Oven Operations in 1923

Product	Unit	Production	Sales Quantity	Sales Value Total	Sales Value Average
Tar	Gal.	440,907,109	211,739,469	$9,250,552	$.044
Ammonia:					
Sulphate	Lb.	915,926,762	884,952,912	25,954,413	.029
Ammonia liquor (NH_3 content) a.	Lb.	58,699,902	57,859,699	5,754,463	.099
				31,708,876	
Sulphate equivalent of all forms	Lb.	1,150,726,370	1,116,391,708		
Gas:					
Used under boilers, etc.	M. cu.ft.		33,740,758	1,820,808	.054
Used in steel or affiliated plants	M. cu.ft.	b601,155,293	200,099,200	22,646,134	.113
Distributed through city mains	M. cu.ft.		65,143,515	23,116,578	.355
Sold for industrial use	M. cu.ft.		19,458,781	4,025,700	.207
			318,442,254	51,609,220	.162
Light Oil and Derivatives:					
Crude light oil	Gal.	c135,647,175	6,539,368	683,545	.105
Benzol, crude	Gal.	4,503,428	4,348,400	768,486	.177
refined	Gal.	12,364,043	12,375,782	3,070,751	.248
Motor benzol	Gal.	80,467,883	80,480,326	13,145,833	.163
Toluol, crude	Gal.	37,777	6,097	978	.160
refined	Gal.	2,847,517	2,628,686	765,052	.291
Solvent naphtha	Gal.	4,162,178	3,399,904	608,084	.179
Other light oil products	Gal.	439,253	198,098	10,605	.054
		d104,822,079	109,976,661	19,053,334	.173
Naphthalene:					
Crude	Lb.	11,872,007	10,047,427	174,216	.017
Refined	Lb.	1,139,922	1,198,206	65,483	.055
		13,011,929	11,245,633	239,699	.021
Other products	.....	.....	.....	214,264	.....
Value of all byproducts sold	.....	.....	.....	112,075,945	.....

(a) Includes an unknown amount of sulphate sold on the basis of pounds of NH_3 content.
(b) Includes gas wasted and gas used for heating retorts.
(c) Refined on the premises to make the derived products shown, 132,517,389 gal.
(d) Total gallons of derived products.
Statistics compiled by H. L. Bennit, U. S. Geological Survey.

Less Light Oil From Coke Plants

The production of light oils—benzol, toluol, solvent naphtha, etc.—in 1924 was probably about 10 per cent less than in 1923, but greater than in any previous year at byproduct coke plants. However, there was very little production at any coal-gas or water-gas plants, as these oils are now usually left in the gas intended for city distribution.

Only a small percentage of the recovered crude light oil is sold as such; more than 90 per cent is refined by the producer, mainly to make "motor benzol," a grade of crude benzol used almost exclusively for blending in motor fuels with gasoline or gasoline and alcohol. No reports are available as yet to show exact percentages refined in 1924 to the different products, but final data for 1923 are given in Table II. The output of each product in 1924 was

Industrial Chemicals in 1924

probably between 10 and 20 per cent less than in the preceding year, corresponding roughly to the lower production of crude light oil.

Prices of benzol, toluol and solvent naphtha were stable throughout 1924, quotations varying within narrow limits, except for a few spot sales which, as usual, fell well outside of the range of market quotations. (See Table III for *Chem. & Met.* quotations.) The supply of each was adequate and undoubtedly will continue so, as a small margin above the price for motor benzol stimulates further refining of this commodity to give "C.P." or other refined grades in ample quantity.

The motor benzol market absorbs promptly all supplies offered and affords indefinite chance for expansion, as the present output is less than 1 per cent of the present gasoline consumption. The price is governed by gasoline prices, and hence was unusually low throughout 1924.

Record Year for Ammonium Sulphate

During 1924 It Became Principal Nitrogen Carrier, With Excellent Prospects for 1925

AMMONIUM SULPHATE is the principal inorganic nitrogen carrier of industry except for Chilean nitrate. In fact, considered on a world basis, ammonium sulphate (2,473,000 tons) is now slightly ahead of Chilean nitrate (2,187,000 tons), though it has not as yet attained this position in the United States. Chilean nitrate is a monopoly of one country, whose main economic resource it is, and the supply is measurably exhaustible.

On the other hand, sulphate of ammonia is derived from coal, as a byproduct of its more economical utilization or by synthesis from the air, and any country that possesses a supply of fuel or of waterpower may develop a production of its own, based upon these comparatively inexhaustible reserves.

Market conditions in 1924 have been favorable, on the whole. The downward price tendency that marked the close of 1923 halted with the opening of the new year and the spring demand, but prices fell off in April to a low point in August, since when heavy buying brought about prospects of a shortage in supply and caused a gradual increase to date. At present writing, the amount available for the coming fertilizer season appears closely booked, even though production seems to have turned the corner, and the trend is now upward.

Ammonia production at byproduct works was probably about 10 per cent less in 1924 than in 1923, but it certainly exceeded the average for the 3-year period preceding by a substantial amount. The production of ammonia by synthetic processes was also greater in 1924, but the output of other sources of ammonia probably did not change materially.

Since the war this country has become an exporter of sulphate of ammonia and now bulks large in the Oriental market. Our exports for 1923 were about 170,000 tons and for the first 10 months of the current year about 100,000 tons. Our export for the year probably fell 35,000 or 40,000 tons below that of the year preceding. As the demands of the Orient, of Japan and Java in particular, have increased rather than diminished, it is evident that this business is returning to the English producers, who enjoyed it up to 1914. Indeed, English exports to these countries to date are reported as fully up to last year's figures, to which may be added German exports of 45,000 tons to Japan and 14,000 tons to Java for the first half of the year.

To hold this export business, which has amounted to more than one-quarter of our maximum output, without price concessions, the American producer must deliver a quality as good as if not better than that coming from England or Germany. Formerly our 25 per cent grade was higher than much of the English product, and the equal of Germany's; but the lessons of the war have taught England to produce a dry neutral, which grades up to 25½ per cent ammonia. Furthermore, it is acid free, does not rot the bags in which it is shipped, and therefore is much less subject to loss in ocean shipping. More than 80 per cent of England's output is now reported to be of the dry neutral grade. In Germany also the process of manufacturing the synthetic sulphate facilitates the production of a large-grained acid-free sulphate of excellent quality.

Table I—Estimated Production and Distribution of Ammonium Sulphate and Other Ammonia in U. S.
(Tons of nitrogen)

	1923	1924
Production:		
At coke ovens	118,500	107,000
At gas works	5,500	5,500
Bone distillation, etc.	200	200
From the air	3,500	3,500
Imports as $(NH_4)_2SO_4$	800	1,000
Total available	128,500	117,200
Disposition:		
In mixed fertilizers	40,000	45,000
Sulphate used as fertilizer	2,000	2,000
Anhydrous ammonia	13,500	13,500
Aqua ammonia	18,600	18,600
In explosives	7,200	7,200
In ammonium salts (chemicals)	5,000	5,000
Export	34,500	27,000
Apparent increase or decrease in stocks	+7,700	—1,100
Total disposition	128,500	117,200

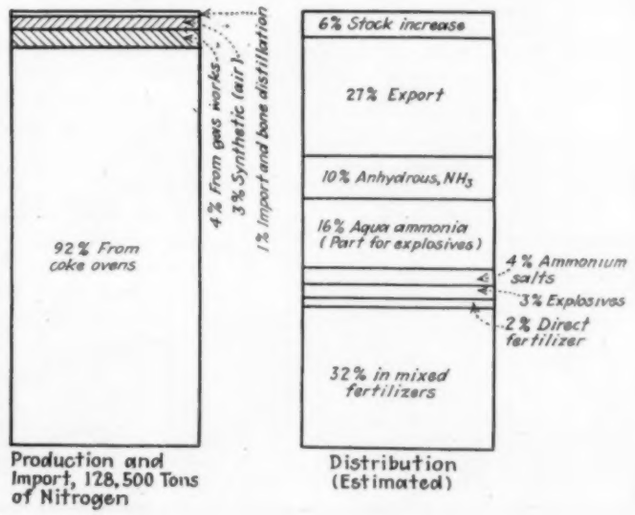


Fig. 1 — Ammonia Nitrogen in 1923

Based on revised data for the year 1923 according to method used by Prof. H. A. Curtis in "The Nitrogen Survey" prepared for the Bureau of Foreign and Domestic Commerce, 1923-1924.

Industrial Chemicals in 1924

Better Tools for Gaging Prices

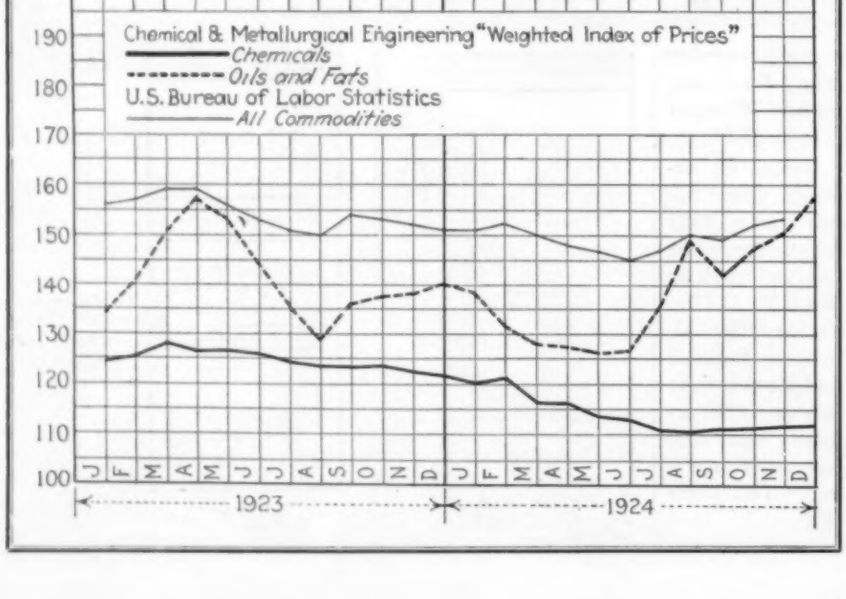
Announcing a Revision of Chem. & Met.'s Weighted Index of Chemical Prices and the Construction of a New Price Index for Oils and Fats

THE ADVANTAGES of the index number as a means of following price trends are so logical and apparent that it is scarcely necessary to recall them here. Particularly in the case of so diversified a market as that of the chemical and closely related industries is it advantageous to reduce prices to a definite and comparable basis. In a few instances, perhaps, a simple average of the quotations of a group of commodities may serve satisfactorily for comparative purposes provided all are of approximately equal importance and are quoted on the basis that makes fluctuations strictly comparable. But in the case of the chemical market neither of these requirements exists, for there is a wide variation in the importance of even the most representative articles, and furthermore market quotations are commonly given in such units as pounds, gallons, per cent, hundredweight, barrels or tons.

In order to provide its readers with a more satisfactory method of gaging prices in the chemical market, this magazine in January, 1922, announced the *Chem. & Met.* Weighted Index of Chemical Prices, designed to represent qualitatively and quantitatively the different branches of the chemical industry. Twenty-five commodities were selected and weighted according to their relative importance as shown by the 1919 Census of Manufactures and the import statistics of that year. At the inception of this index number it was contemplated that these weighting factors should be revised periodically as new census data became available. The recent publication of the results of the Census of Manufactures for 1923 offers the basis for such a revision and at the same time affords an opportunity to make a number of other changes that 3 years experience has shown to be desirable. The latter consist principally of the addition of a number of new commodities and a regrouping of some of the others in such a way as to construct a new index number for the prices of oils and fats. Cottonseed and linseed oils, although not strictly chemical products, were included in the original index because of their industrial significance. Those of our readers who have followed the week-to-week trend of the index will recall that the fluctuations of these commodities have often had marked effect on the index number. This was due, of course, to the dominating influence of the commodity weights for these two products, since in 1919 crude cottonseed oil production amounted to almost a billion and a half pounds, while well over fifty million gallons of linseed oil was produced or imported.

Table I—Basic Data for *Chem. & Met.* Weighted Index of Chemical Prices

Commodity	Base Price (1913-1914)	Total Production 1923	Imports 1923	Commodity Weight
1. Acetic acid, 28%	$1.71 per 100 lb.	84,888,000 lb.	701,086	85,500,000 lb.
2. Citric acid	.5070 per lb.	5,688,000 lb.	757,864	6,445,000 lb.
3. Hydrochloric acid, 20%	1.30 per 100 lb.	393,820,000 lb.	954,700	394,775,000 lb.
4. Nitric acid, 42%	.0488 per lb.	218,750,000 lb.	7,460	218,760,000 lb.
5. Sulphuric acid, 66 deg. Be.	20.00 per ton	4,412,478 tons	11,754	4,424,000 tons
6. Alcohol, 188 pr. denatured No. 5	0.3467 per gal.	18,809,225 gal.	nil	18,800,000 gal.
7. Methanol, 95%	0.4558 per gal.	8,525,800 gal.	15,586	8,541,000 gal.
8. Ammonia, anhyd.	0.2500 per lb.	33,805,000 lb.	41,718	33,847,000 lb.
9. Ammonium sulphate	2.61 per 100 lb.	1,238,000,000 lb.	7,084,000	1,245,000,000 lb.
10. Lithopone	0.0375 per lb.	198,398,000 lb.	20,879,258	219,290,000 lb.
11. Bleaching powder, 35%	1.25 per 100 lb.	293,750,000 lb.	1,394,745	295,144,000 lb.
12. Borax	0.0375 per lb.	106,184,000 lb.	nil	106,184,000 lb.
13. Copper sulphate	4.93 per 100 lb.	32,304,421 lb.	10,162,545	42,467,000 lb.
14. Formaldehyde	0.085 per lb.	20,213,873 lb.	nil	20,214,000 lb.
15. Bichromate of soda	0.0475 per lb.	46,000,000 lb.	nil	46,000,000 lb.
16. Caustic soda solid, 76%	1.81 per 100 lb.	861,922,000 lb.	123,801	862,000,000 lb.
17. Soda ash, 58% light	0.69 per 100 lb.	3,415,974,000 lb.	2,305,548	3,418,000,000 lb.
18. Sulphur, crude	22.00 per ton	2,035,847 tons	nil	2,036,000 tons
19. Caustic potash	0.0370 per lb.	2,000,000 lb.	10,837,197	13,000,000 lb.
20. Benzol, pure	0.255 per gal.	16,708,906 gal.	701,857	17,500,000 gal.
21. Aniline oil	0.1025 per lb.	26,671,961 lb.	nil	26,500,000 lb.
22. Phenol, U.S.P.	0.0854 per lb.	2,180,244 lb.	126,618	2,300,000 lb.
23. White lead (dry)	0.0533 per lb.	325,746,000 lb.	336,892	326,000,000 lb.
24. Zinc oxide	0.0667 per lb.	300,982,000 lb.	2,072,891	303,000,000 lb.
25. Salt cake	11.00 per ton	181,661 tons	nil	182,000 tons



Industrial Chemicals in 1924

Table II—Basic Data for *Chem. & Met.* Weighted Index of the Prices for Oils and Fats

Commodity	Base Price (1913-1914)	Total Production 1923	Imports 1923	Commodity Weight
1. Cottonseed oil, crude oil	$0.0619 per lb.	973,753,164	nil	974,000,000 lb.
2. Linseed oil	.4967 per gal.	87,141,300	5,696,000	92,837,000 gal.
3. Coconut oil	.1025 per lb.	235,918,724	181,908,000	417,826,000 lb.
4. Corn oil, crude	.0645 per lb.	111,343,267	nil	111,343,000 lb.
5. Chinawood oil	.0693 per lb.	nil	87,291,675	87,292,000 lb.
6. Castor oil	.0867 per lb.	37,382,715	1,019,395	38,401,000 lb.
7. Soya bean oil	.0637 per lb.	1,404,035	33,221,548	34,625,000 lb.
8. Peanut oil, crude	.0900 per lb.	5,358,647	4,876,117	10,235,000 lb.
9. Palm oil	.0732 per lb.	nil	128,494,679	128,495,000 lb.
10. Menhaden oil	.3105 per gal.	7,461,609	nil	7,460,000 ga.
11. Tallow, inedible	.06875 per lb.	465,868,998	10,823,475	476,692,000 lb.
12. Red oil	.0625 per lb.	45,191,114	11,083	45,200,000 lb.
13. Oleo oil	.1023 per lb.	158,610,091	6,261	158,617,000 lb.
14. Sulphur oil (olive foots)	.0764 per lb.	nil	24,000,000	24,000,000 lb.
15. Glycerine, crude, 80%	.1325 per lb.	99,578,781	14,119,561	113,698,342 lb.

Having decided to make the index of more strictly chemical character and in order to give better representation to paint chemicals, several important pigments were added to the group—namely, white lead, zinc oxide and lithopone. The last named was substituted for barium chloride, for lithopone also serves as a representative product of the barium chemical industry. The only other changes in the group were the omission—because of its relative unimportance—of potassium carbonate, 80 to 85 per cent, and the addition of a third coal-tar product —phenol U.S.P. The list of these twenty-five chemicals, together with their basic prices (average for year July, 1913, to June, 1914) and the commodity weights, are in Table I.

The basic data for the new index on Oils and Fats are presented in Table II. The fifteen commodities selected for this purpose thoroughly represent the well-defined market classification of "Vegetable and Animal Oils and Fats." Furthermore, the products and grades used are so typical that their weighted fluctuations may be regarded as a truly accurate gage of price trends in this market.

Table III—*Chem. & Met.* Weighted Indexes of Prices

1923	Chemicals	Oils and Fats
January	124.31	134.77
February	125.59	141.05
March	128.21	150.82
April	126.45	157.33
May	126.76	153.39
June	126.26	144.54
July	124.34	135.52
August	123.69	129.31
September	123.28	135.77
October	123.71	137.71
November	122.45	138.10
December	121.54	140.05
1924		
January	120.08	138.39
February	121.05	131.71
March	116.27	128.02
April	116.31	127.53
May	113.60	125.88
June	112.92	126.30
July	110.61	136.25
August	110.22	149.02
September	110.94	142.68
October	110.10	147.30
November	111.86	150.53
December	112.00	157.56
1925		
January 5	112.69	158.79
January 12	112.91	157.79
January 19	113.45	158.02

The method of calculation employed in computing these two series of index numbers is that widely used by governmental and other statistical agencies, and was described in *Chem. & Met.*, Jan. 11, 1922, page 88. Briefly it consists in the following three steps: (1) A commodity weight was obtained for each article by adding the quantity produced in the United States during 1923 to the quantity imported during the same year. (2) The average weekly or monthly price of each commodity during the period under consideration was then multiplied by the corresponding commodity weight and these products were added separately for each month. (3) These weekly or monthly aggregates were then compared with the average for similar aggregates for the pre-war year, July, 1913, to June, 1914, and were finally expressed in percentages of that base. For the purpose of comparison the indexes for Chemicals and for Oils and Fats were computed monthly since January, 1923, and will be continued on a weekly basis in this magazine. The values for 1923 and 1924 are shown in Table III and in the accompanying chart.

An index of 124.31 such as that reported for chemicals in January, 1923 (see Table III), means in effect that prices at that date were 24.31 per cent above those of the pre-war year. Considering the depreciation of the dollar during this interval, present prices are relatively lower than the 1913-14 quotations. The chemical index mounted somewhat during the first 3 months of 1923 and then began a gradual decline that continued until the end of last summer. Improvement which began in August, 1924, has continued steadily and by the end of the year the index stood at 112.00. Further improvement has been noted since the turn of the year. The index for the week of Jan. 5 was 112.69 and that for Jan. 12 was 112.91. The slight rise in the curve for the month of February, 1924, is of some interest because it marks the beginning of the upward trend in the price of bleaching powder.

The weighted index for the prices of Oils and Fats has naturally shown considerably wider fluctuations, because it represents a much less stable market. In contrast with most heavy chemicals, oils and fats are quoted at relatively higher prices when compared with pre-war levels. After the peak of 157.33 in April, 1923, the index fell off rapidly until in August it reached 129.31. From then until the end of the year there was some recovery, but a decline in early spring and summer of 1924 carried the index to the low level of 125.88 in May, 1924. Since then there has been a remarkable advance and as the year closed the index stood at 157.56. There was a further increase in the first week in 1925, when the index reached 158.79 only to fall in the week of Jan. 12 to 157.79 as a result of a decline of a quarter of a cent per pound in the price of crude cottonseed oil.

Chem. & Met. Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	113.45
Last week	112.91
Jan., 1924	120.08
Jan., 1923	124.31

The weighted index number for chemical prices revised as described elsewhere on this page is compared for the past 2 weeks and for January, 1923 and 1924.

Chem. & Met. Weighted Index of Prices for Oils and Fats

Base = 100 for 1913-14

This week	158.02
Last week	157.79
Jan., 1924	138.39
Jan., 1923	134.77

The weighted index number shown here for the prices of oils and fats was constructed by the method explained in the accompanying article. It will continue on a weekly basis.

Industrial Chemicals in 1924

Index of Chemical and Oil Product Reviews

Acetate of Lime.....136	Carbon Black 140	Linseed Oil 142	Prussiate of Soda.....135
Alcohol 134	Caustic Potash 138	Lithopone 138	Silicate of Soda.....139
Aniline Oil 136	Caustic Soda 133	Menhaden Oil 143	Soda Ash 138
Arsenic 132	Chinawood Oil 143	Naphthalene 136	Soya Bean Oil.....142
Benzene 141	Coconut Oil 143	Naval Stores 143	Sulphur 140
Bichromate of Potash..139	Copper Sulphate 139	Nitrate of Soda.....136	Tallow 135
Bichromate of Soda...134	Cottonseed Oil 141	Nitrite of Soda.....137	Tartaric Acid.....140
Bleaching Powder 133	Cresylic Acid 137	Oxalic Acid 135	White Lead 137
Calcium Arsenate 132	Glycerine 142	Phenol 141	Zinc Oxide 139

Record Production of Arsenic

Domestic production of arsenic in 1924 reached record proportions. There were nine companies in the producing field and the Department of the Interior reports their sales as 14,500 short tons, with the added statement that these sales represented 71 per cent of the total white arsenic produced. Hence the total output was in excess of 20,422 tons. The census figures for 1923 place production for that year at 16,788 tons, of which 14,697 tons was offered for sale. Imports during the past year were approximately 9,000 tons and were 10,575 tons in 1923. Total supply, therefore, was 29,422 tons in 1924 and 27,363 tons in 1923.

Arrivals of arsenic from foreign countries were large, but so were the totals recorded in 1923. Mexico held its premier position as a supplier, with Germany, Japan, Belgium, England, Canada, China, the Dominican Republic and Australia drawn upon for stocks. Imports, by months, offer the following comparisons, with official returns for 1924 incomplete:

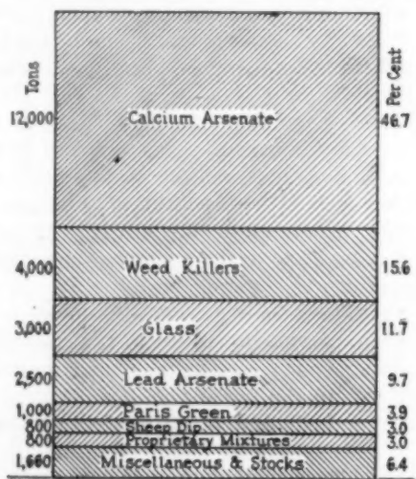
IMPORTS OF WHITE ARSENIC

	1924,Lb.	1923,Lb.
January	1,925,486	1,879,639
February	1,545,024	2,115,339
March	2,181,900	1,392,289
April	2,218,339	1,476,066
May	2,386,871	2,118,338
June	2,072,315	2,365,475
July	1,537,902	1,212,354
August	570,970	1,335,402
September	678,533	1,480,482
October	1,304,872	1,393,368
November	799,443	1,566,775
December	*	2,814,018
Total	17,051,655	21,149,545

* Figures not yet available.

Manufacturers of calcium arsenate were the largest consumers of white arsenic. Trade estimates give a total production of 29,000,000 lb. for arsenate in the crop year, Sept. 1, 1923, to Aug. 31, 1924. The arsenic content of the arsenate varied according to producer, but about 12,000 tons of arsenic is estimated to have been consumed in this industry. During the same period 4,000 tons of arsenic is estimated to have been used in the manufacture of weed killers, 3,000 tons in the glass trade, 2,500 tons in the manufacture of lead arsenate, 1,000 tons in paris green, 800 tons in sheep dips, 800 tons in proprietary mixtures, with 1,660 tons representing miscellaneous uses and stocks unsold at the end of August. Some variations in the above will be found in compilations for the calendar year period, as glass makers bought large amounts in the latter part of the year.

While the supply of arsenic, including domestic production and importations, was the largest on record, trading operations were not satisfactory. This resulted from a reduced call for calcium arsenate, requests for deferred contract deliveries of arsenic, the flooding of the market with resale offerings and a steady decline in market values. At the beginning of the year quotations were 13@13½c. per lb., which was also the high, as values steadily declined until the latter part of the period to a level of 6@6½c. per lb. At times imported and domestic grades were on an equal selling basis, but during the greater part of the year imported offerings were offered under domestic price levels.



Distribution of Arsenic by Industries

The high and low prices for white arsenic, together with comparisons for the past 6 years, were:

	Hight	Low		High	Low
1924	$0.13½	$0.06	1921	$0.10	$0.05½
1923	.16	.08½	1920	.16	.10
1922	.15½	.06	1919	.10	.08

Large Surplus Production of Calcium Arsenate

The large increase in consumption of calcium arsenate in the cotton year ended Aug. 31, 1923, when 31,000,000 lb. were taken from the market, gave rise to the belief that a much larger amount would be used in the 1923-24 crop year. Manufacturers of arsenate, therefore, made plans to increase their output to a point where the expected consumptive demand might be taken care of. Contracting for arsenate for 1924 delivery started in October, 1923, and was active over the remainder of the year, so that producers entered the new year with approximately 28,000,000 lb. sold ahead, as compared with 16,000,000 lb. for the corresponding period in the preceding year.

This presaged a very large growth for the arsenate trade for the year, but early in January a prolonged cold period was encountered in the cotton-growing belt and buying of arsenate summarily ceased. Moreover, it developed that many of the contracts held by producers were worded in such a way that they placed very little obligation on buyers. Cancellations, then, became numerous and the large volume of sales as earlier reported was readjusted downward and left producers confronted with the task of marketing large surplus stocks.

In addition to the period of extreme cold weather in the early part of the year, conditions in the spring months were unfavorable to boll-weevil germination. Hence the active buying movement that usually characterizes the dusting season was greatly reduced because of lessened boll-weevil damage. Production of arsenate was adversely affected by these conditions and trade estimates place the output for the cotton year Sept. 1, 1923, to Sept. 1, 1924, at 29,000,000 lb. This total is large in comparison with preceding years, with the exception of 1922-23. The depressed condition of the industry is revealed by the wide discrepancy between production and consumption. Estimates of the latter state that less than 18,000,000 lb. of arsenate was actually consumed last year. This would leave a carry over into the new crop year of about 11,000,000 lb.

With surplus stocks of such large volume, it becomes evident that arsenate production in 1925 will fall far short of the totals for the 2 years immediately preceding unless boll-weevil ravages take on unwonted activities. Contracting for arsenate in the latter part of 1924 was very light and weather conditions over the first 4 months of the year undoubtedly will become the most important factor in determining productive and trading activities. Incidentally, the action of the arsenate market will have an important bearing on trading in arsenic.

At the beginning of the year arsenate was rather unsteady in price, with the open quotation at 11½c. per lb. at

Industrial Chemicals in 1924

works. The price trend through the year was downward and the year closed with sellers offering at 8c. per lb. The latter was the lowest quotation for the year, but sales at times were made at private terms under the 8c. level. In 1924 prices ranged from 11½c. per lb. to 20c. per lb., so sale prices last year showed a material reduction. Many consumers in Georgia, which state consumed more than one-half the arsenate sold in 1924, were supplied by the state at delivered prices with which outside producers were unable to compete.

Moderate Decline in Production of Caustic Soda

Producing plants operated at about 75 per cent of capacity last year as compared with 82 per cent in 1923. The decline in operations was more marked in the ammonia soda plants than in those using the electrolytic process. While the output of caustic soda was lower than in 1923, a large tonnage was moved and production for the year is estimated at 400,000 tons. As there was a decline of about 11,000 tons in the export movement, it is evident that the falling off in home consumption of caustic soda was less than might have been expected considering the slow position of business in general. It is equally evident that consumption in certain industries is increasing, as this offers the explanation for the close harmony between domestic buying in 1924 and in 1923. The latest official figures covering production of caustic soda are found in the census returns, which give the following data for 1923 and 1921:

	1923	1921
Ammonia soda process:		
Establishments	6	7
Production, tons.	314,195	163,044
For sale, tons.	311,838	162,906
Value	$18,022,578	$10,578,895
Electrolytic process:		
Establishments	17	18
Production, tons.	122,424	75,547
For sale, tons.	119,123	67,990
Value	$7,033,969	$6,049,505

This gives a total production for 1923 of 436,619 tons. Deducting exports of 57,342 tons would leave a supply of 379,277 tons for domestic needs. Taking 1924 production at 400,000 tons and deducting exports of 46,000 tons leaves a home supply of 354,000 tons for the past year.

On another page of this issue will be found a graphic presentation of distribution of caustic soda according to consuming industries. In recent years refiners of petroleum have increased their requirements and in the past 2 years there has been a large consumption in the manufacture of artificial silk, although developments in the latter industry in the past year have cut down the unit consumption of caustic soda. The soap trade, however, retains its place as the largest consumer of caustic, with an estimated use of 100,000 tons last year, or one-quarter of the total production.

Competition in caustic soda in foreign markets has been keen and in many places domestic sellers have lost ground due to the more favorable position of foreign producers. Exports from Great Britain increased, reaching a total of 91,449 tons for the first 11 months of the year, as compared with 80,239 tons for the corresponding period of 1923. South American countries were the largest outside buyers of American caustic, with Mexico, Argentina and Brazil as the leaders. Cuba also bought in large volume, as did the Orient. Smaller amounts were shipped to Mediterranean countries and to northern Europe. A comparison of exports in 1924 and 1923 follows:

Record Sales of Arsenic in 1924

According to reports made to the Geological Survey by nine companies producing white arsenic, total sales for 1924 amounted to 14,500 short tons. Sales represented 71 per cent of total production. This compares with sales of 14,184 short tons in 1923. Average prices were 9c. per lb. in 1924 and 10½c. per lb. in 1923. The total white arsenic bought for consumption in 1924 from domestic and foreign sources amounted to approximately 23,000 short tons.

EXPORTS OF CAUSTIC SODA

	1924 Lb.	1923 Lb.
January	9,847,118	7,891,279
February	7,814,591	7,405,064
March	5,997,383	9,855,416
April	8,044,417	12,284,777
May	6,237,549	11,269,945
June	6,321,297	9,996,569
July	8,715,062	11,288,716
August	6,872,574	9,604,318
September	7,206,614	8,397,968
October	8,742,418	7,498,635
November	7,696,929	9,559,114
December	*	9,631,927
Total	83,495,952	114,683,728

*Figures not yet available.

Contract prices for 1924 deliveries were announced in the fall of 1923 and quoted solid caustic soda 76 per cent in standard drums at $3.10 per 100 lb. in carlots, at works. This price was not changed during the year. About the middle of November contract prices for 1925 were made public. The quotations were: $3.10 per 100 lb. flat for solid 76 per cent, actual test; $3.50 per 100 lb. flat for ground, flake and powdered 76 per cent, actual test. These prices are for carload lots, in standard drums, f.o.b. works. Shading of prices for prompt shipment was prominent at times, especially on jobbing quantities, but leading producers generally held the market on a stable basis throughout the year. Quotations for export were less stable than those given for the domestic trade. Export prices varied according to seller and according to port of destination, the latter being forced by competitive conditions in foreign markets. Considerable quantities were sold for export shipment at prices ranging from $2.75 to $2.95 per 100 lb., although $3.05 per 100 lb. was an open quotation for the greater part of the year.

Higher Prices Marked Sales of Bleaching Powder

In the latter part of 1924 contract prices for 1925 delivery were placed at $1.25 per 100 lb. in carlots, large drums, at works. A large part of the consuming trade covered requirements at that level and in this way large quantities of low - priced bleached powder entered consumption in the past year. Price tendencies in 1925, however, reversed those of 1924 and every change made was in favor of sellers. The year opened with producers offering bleaching powder on contract and for prompt shipment from works at $1.25 per 100 lb. On Jan. 5 an advance to $1.50 per 100 lb. was announced. This was followed on Feb. 14 by a further rise to $1.75 per 100 lb. and the latter figure on March 15 gave way to a sales price of $1.90 per 100 lb. In November producers sent out announcements to the effect that 1925 contracts would be taken at $1.90 per 100 lb. and that prompt shipments from works would command a premium of 10c. per 100 lb., thus making the latter $2 per 100 lb. The higher prices were maintained on a fairly stable basis throughout the year. During the hot weather period, when price cutting was the rule rather than the exception in 1923, conditions were reversed last year. This does not mean that absolute uniformity prevailed, for sales were made at $1.70@$1.75 per 100 lb., but the volume of such sales was relatively light and there were instances where low priced sales did not turn out to the advantage of sellers, and a general price cutting which threatened at times to upset the market was held in abeyance.

Producers entered the year with rather large stocks on hand, and this condition, to a greater or less extent, prevailed throughout the period. Because of this and also due to the fact that consuming in some industries was lessened as a result of preference for liquid chlorine, production of bleaching powder was curtailed and is estimated to have fallen below 100,000 tons. In the last quarter of the year there were reports of suspended operations at some plants because of accumulated stocks and because of the light contracting movement for 1925 deliveries. Census figures covering domestic production of bleaching powder in 1923 and 1921 offer the following comparisons:

	1923	1921
No. of establishments	21	19
Production, tons	146,675	82,577
Value	$5,192,385	$4,296,101
Average unit value, ton	$35.35	$52.32

Export buying of bleaching powder was less than in 1923, with total shipments to foreign markets declining

Industrial Chemicals in 1924

about 25 per cent. A comparison of shipments abroad shows the following:

EXPORTS OF BLEACHING POWDER

	1924 Lb.	1923 Lb.
January	2,047,458	4,266,919
February	2,071,947	3,726,251
March	1,318,383	2,589,072
April	1,865,051	659,335
May	1,751,228	2,959,905
June	2,479,209	2,584,201
July	1,664,109	2,569,848
August	1,420,088	2,292,534
September	1,813,550	1,692,366
October	1,942,370	2,616,974
November	1,538,509	1,415,637
December	*	1,455,386
Total	19,911,902	28,828,428

* Figures not yet available.

Prevailing prices for bleaching powder in carlots, packed in standard drums, f.o.b. works, give the following high and low for the years enumerated, the prices representing a basis of 100 lb.:

	High	Low		High	Low
1924	$2.00	$1.25	1921	$2.75	$2.00
1923	2.00	1.25	1920	2.50	2.10
1922	2.00	1.60	1919	2.00	1.25

Denatured Alcohol Production at New High Record

According to the report of the Commissioner of Internal Revenue, the production of ethyl alcohol in the fiscal year ended June 30, 1924, amounted to 135,897,725 proof gallons, which compares with 122,402,850 proof gallons in 1923. There was withdrawn from warehouse for tax-free purposes, including denaturation, export, hospitals and educational institutions, 121,753,633 proof gallons, while the amount withdrawn on payment of tax amounted to 9,379,729 proof gallons. Actual quantity withdrawn for denaturation amounted to 121,576,196 proof gallons, against 105,819,404 proof gallons in the preceding fiscal year.

Denatured—Production of denatured alcohol for the fiscal year was the largest on record, amounting to 67,687,295 wine gallons, which compares with 57,565,000 wine gallons in 1923 and 55,680,000 wine gallons in 1917, the previous high mark in the history of the industry. Of the total produced, 34,602,003 wine gallons was completely denatured and 33,085,292 wine gallons was specially denatured. In 1923 27,128,229 wine gallons was completely denatured and 30,346,913 wine gallons was specially denatured.

Demand for denatured alcohol for use as an anti-freezing material in the automobile field accounted, in large measure, for the gain in consumption. There also was a healthy gain in consumption for industrial purposes, especially as a solvent.

Prices for denatured alcohol were higher than a year ago and considerably higher than 2 years ago. The uplift was caused chiefly by the advance in basic materials. Producers of feedstuffs competed keenly for molasses, and this important raw material advanced sharply. Prices for grain advanced on a world's shortage and little or no relief was obtained from this quarter. Stocks of denatured alcohol as the year closed were almost down to nil and everywhere the market was in a tight position.

High and low prices by months, for denatured alcohol, formula No. 5, 188 proof, in bbl. (5c. less per gal. for drums), follow:

	1924 High	1924 Low	1923 High	1923 Low	1922 High	1922 Low
Jan.	$0.50½	$0.50	$0.38	$0.37½	$0.40	$0.36
Feb.	.50½	.50	.38	.37½	.36	.34
March	.50½	.50	.38	.37½	.34	.34
April	.50½	.50	.38	.37½	.34	.25
May	.50½	.50	.40	.37½	.28	.25
June	.50½	.50	.40	.40	.31	.28
July	.47½	.47	.42½	.40	.31	.31
Aug.	.47½	.47	.42½	.42½	.32	.31
Sept.	.51½	.50	.44½	.43	.34	.34
Oct.	.54½	.54	.46½	.44½	.36	.36
Nov.	.61	.60	.50½	.46½	.36	.36
Dec.	.61	.60	.50½	.50½	.38	.36

Imports of Synthetic Aromatic Chemicals in 1924

	Lb.	Value
January	3,448	$8,854
February	2,299	5,930
March	4,145	8,182
April	3,228	5,058
May	4,002	15,943
June	4,895	10,500
July	4,537	7,766
August	7,108	16,853
September	3,621	14,518
October	12,863	45,204
November	11,364	32,900
December	11,553	27,950
Total	73,063	$199,658

Methanol—Other solvents made inroads on methanol and the market moved into an unsatisfactory position from the producer's standpoint. The lessened demand was reflected in actual production, which slumped to the extent of 20 per cent compared with 1923. Prices eased considerably, the market for 95 per cent material opening at 90c. per gal., in drums, and closing the year at 70c. per gal., in drums, carload lots. Estimated production of methanol in 1924 was 7,000,000 gal., which compares with 8,593,727 gal. in 1923 and 6,799,436 gal. in 1922. Export trade also suffered in comparison with the preceding year and it was reported that European producers were able to offer rather stiff competition in foreign markets.

Production of methanol, by months, in gal., for the past 2 years, according to statistics compiled by the Department of Commerce, follows:

	1924	1923
January	705,747	893,418
February	690,403	730,590
March	741,505	791,457
April	698,126	713,643
May	623,107	798,369
June	492,902	736,806
July	404,132	652,955
August	444,612	654,822
September	464,702	574,124
October	539,333	666,364
November	.....	756,746
December	.....	624,433
Total	*5,804,569	8,593,727

* Total for 10 months.

In comparing the 1924 figures on production with 1923 it should be noted that the number of plants reporting to the Department of Commerce has decreased from 5,217 to 3,732. Beginning with 1924, companies with a capacity of 723 cords, which have been idle for a long period, have been dropped from the industry total. The total number of wood distillation plants at the close of 1924 was placed at 4,794, as against 5,356 in December, 1923.

The range of prices for 95 per cent methanol, in drums, per gal., by months, for the past 2 years, in the New York market, follows:

	1924 High	1924 Low	1923 High	1923 Low
January	$0.91	$0.89	$1.19	$1.09
February	.91	.89	1.19	1.17
March	.89	.89	1.15	1.15
April	.89	.89	1.15	1.15
May	.89	.88	1.14	1.14
June	.78	.76	1.14	1.14
July	.78	.76	1.14	1.14
August	.72	.70	1.14	1.09
September	.72	.70	1.01	1.01
October	.72	.70	.94	.89
November	.70	.70	.89	.89
December	.70	.70	.89	.89

Large Contracting Movement in Bichromate of Soda

According to census figures, production of bichromate and chromate of soda in 1923 amounted to 26,879 tons. Imports of chrome ore in that year were 128,763 tons. It is estimated that about 25 per cent of this chrome ore was consumed in the manufacture of bichromate and chromate. Official returns for December have not yet been published, but in the 11 months ended November, 1924, arrivals of chrome ore were 112,927 tons. On this basis imports for the year would approximate 122,000 tons. The steel trade is said to have taken about 90,000 tons of ore. After allowance for production of bichromate of potash, this would appear to leave a supply equivalent to about 23,000 tons of bichromate and chromate of soda. Production was reported to have been confined to three firms, one of which consumed a large part of its production. Census figures for 1923 and 1921 compare as follows, the figures for production including bichromate and chromate:

	1923	1921
No. of establishments	5	9
Total production, tons	26,879	18,169
For sale, tons	26,879	18,169
Value	$3,994,566	$3,823,465

Contract prices in the early part of the year were 7¼@7½c. per lb. and a large number of consumers covered requirements ahead. Spot supplies opened at 7⅜@7½c. per lb. For a time the spot market was sustained at 7½c. per lb. and upward according to quantities involved. Demand for additional lots was not heavy and competition among sellers was keen enough to bring out concessions whenever large lots were in question. Values eased off as the year advanced and the lowest levels were reached in the latter part of the period. Some producers waged

Industrial Chemicals in 1924

an active selling campaign to secure contracts for 1925 deliveries, with business said to have been placed at prices ranging from 6c. to 6¾c. per lb., although earlier in the season contract quotations gave 6⅝c. per lb. as an inside figure. Reports of sales for prompt shipment also were said to have been made at the 6c. per lb. level and the same held true for export. Toward the close of the period the market showed a slight recovery and asking prices were advanced to 6¼@6¾c. per lb. according to seller and quantity. High and low prices for the past 6 years were:

	High	Low		High	Low
1924	$0.07¼	$0.06	1921	$0.08½	$0.07½
1923	.08½	.07¼	1920	.33	.09½
1922	.07½	.06¼	1919	.40	.17

Statistics governing exports of bichromate of soda are not given separately in the government returns. Buying for export during the past year was spasmodic, with preferential tariffs working against domestic producers in the case of at least one European country that in previous years had been a large buyer. Dry color makers were reported to have bichromate fully up to normal, with a decline in the movement to the textile trade. Tanning operations were not active, but lack of activity was offset to a certain extent by the growing use of bichromate in tanning heavy leather.

Change in Duty Features Oxalic Acid Market

Oxalic acid was one of the chemicals in which tariff developments played an important part during 1924. A petition for an increase of 50 per cent in import duty had been filed in 1923 and under date of Dec. 29 last year the President signed a proclamation granting this request, thus raising the import duty from 4c. to 6c. per lb. As the higher duty did not become effective until January, 1925, it had no actual bearing on trading in 1924, but made a radical change in the market at the end of the year and placed domestic manufacturers in a position of advantage in competing with the imported material.

Production of oxalic acid in this country last year was confined to two companies. The plants did not operate at capacity and for a time one plant was closed. Prior to the war there was no domestic output and consuming requirements were entirely taken care by imported acid. Last year domestic oxalic is said to have accounted for about one-half of domestic needs. Census figures do not give separate returns for production of oxalic acid, but in conjunction with the tariff investigation in 1923, manufacturers reported that the output in 1922 amounted to 3,973,807 lb. Production in 1924 is said to have been slightly less than 3,000,000 lb.

The laundry trade is the largest outlet for oxalic acid and was credited with taking 50 per cent of the marketable supply in 1924. The remainder was distributed, 20 per cent to the chemical industry, 15 per cent to the textile trade, 5 per cent for bleaching purposes and 10 per cent for miscellaneous uses.

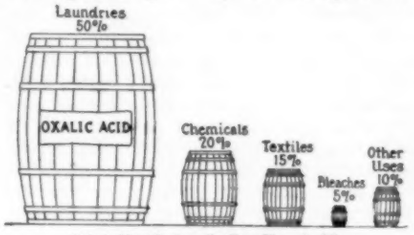
Imported oxalic acid was in good supply throughout the year and was able to compete at the low price levels that ruled despite the levying of an import duty of 4c. per lb. Imports, by months, offer the following comparisons with 1923:

IMPORTS OF OXALIC ACID

	1924 Lb.	1923 Lb.
January	195,626	534,893
February	473,877	157,279
March	241,857	228,025
April	190,461	129,737
May	118,828	383,279
June	180,118	145,851
July	169,158	172,925
August	247,516	160,402
September	187,786	157,394
October	276,500	186,809
November	381,698	144,262
December	*	228,441
Total	2,663,425	2,629,297

* Figures not yet available.

The year opened with market values at 12@12½c. per lb., but competition



Distribution of Oxalic Acid by Industries

was keen and the quoted figures were barely steady. Values were on a downward trend for the first half of the year and reached a level of 9c. per lb. Sales became a matter of private negotiation and transactions are reported to have been made under 9c. per lb., although the latter remained the open quotation and throughout the latter half of the year 9½c. per lb. was asked. The announcement of an increase in duty came too late to affect prices in December, but the last two trading days of the year found an irregular market, with some sellers refusing to quote on new accounts and values showing a tendency to advance. The high and low prices for oxalic acid for the past 6 years were as follows:

	High	Low		High	Low
1924	$0.12	$0.09	1921	$0.23	$0.12½
1923	.13½	.11½	1920	.55	.18
1922	.17	.11	1919	.39	.22½

Larger Supplies of Foreign Prussiate of Soda

There was a marked gain in the supply of imported prussiate of soda last year. Total arrivals from foreign countries almost tripled those of 1923. The decline in market values which featured trading in 1923 continued over the past year, and this had some influence in enlarging consumption. In some industries, such as the manufacture of dry colors, it was stated that cyanides had cut in on consumption of prussiates.

Opening prices for prussiate were on a basis of 11½c. per lb. for spot holdings, and offerings were free enough at practically all times to give an easy tone to values. Competition between domestic and imported prussiate also had a bearing on prices. In the latter part of the period sales were made at 9c. per lb. Foreign markets firmed at the end of December and quotations for shipments not only were higher but also indicated that producers abroad were reserved as far as quantities were concerned. This encouraged buying in the spot market both on the part of consumers and by speculative interests.

The lower price levels that ruled during the year will be evident from the comparison of the high and low of preceding years as contained in the following table:

	High	Low		High	Low
1924	$0.11½	$0.09	1921	$0.17	$0.11½
1923	.18½	.10	1920	.33	.17½
1922	.23½	.15½	1919	.33	.16

An analysis of import statistics reveals that, with the exception of January, arrivals from abroad were larger in every month of last year than in the corresponding periods of 1923. Import figures for the 2 years are:

IMPORTS OF PRUSSIATE OF SODA

	1924 Lb.	1923 Lb.
January	168,354	257,817
February	229,490	115,487
March	420,326	129,475
April	267,692	100,905
May	189,411	100,263
June	180,659	69,453
July	346,182	33,797
August	218,584	44,851
September	261,315	68,067
October	379,302	78,778
November	201,159	50,060
December	*	98,218
Total	2,980,111	1,147,171

*Figures not yet available.

Active Call for Tallow Sends Prices to Higher Levels

An advance of 27.3 per cent occurred in the prices named for extra special tallow in the past year, the market closing at the high point on active buying for the soap kettle. Important price gains were made in the last quarter, when heavy sales of finished products forced soap makers into the market on a large scale. A temporary shortage in substitutes was a factor, as soap makers were in need of immediate supplies of raw materials. Late in December 11c. per lb. was paid for extra quality tallow, which compares with 7c. per lb., the low for the year.

	1924		1923		1922	
	High	Low	High	Low	High	Low
Jan.	$0.08	$0.08	$0.09	$0.08½	$0.06½	$0.06½
Feb.	.08½	.08	.09	.08½	.06½	.06½
Mar.	.08	.07½	.09½	.08½	.07½	.06½
Apr.	.07½	.07½	.09	.08½	.06½	.06½
May	.07½	.07½	.08½	.07½	.07	.06½
June	.07	.07	.07½	.06½	.06½	.06½
July	.07½	.07	.06½	.06½	.06½	.06½
Aug.	.08½	.08	.07	.06½	.06½	.06½
Sept.	.08½	.08½	.08	.07½	.07	.06½
Oct.	.09½	.08½	.07½	.07½	.07	.07
Nov.	.10	.09½	.07½	.07½	.08	.07½
Dec.	.11	.10	.08	.07½	.08½	.07½

Industrial Chemicals in 1924

Decline in Surplus Stocks of Acetate of Lime

The large stocks of acetate of lime which were carried into 1924 were greatly reduced as the year advanced. This was accomplished by restricting new production rather than by increased consuming demand. Figures representing production, shipments and stocks, as shown below, are not entirely correct, as they are based on returns from producers, and the percentage of the latter who made reports varied somewhat from month to month.

PRODUCTION OF ACETATE OF LIME

	1924 Lb.	1923 Lb.
January	13,420,193	15,720,839
February	13,172,610	13,469,524
March	14,107,411	14,959,573
April	12,650,393	13,698,154
May	11,538,625	14,822,716
June	9,396,138	14,439,164
July	7,629,870	13,179,716
August	8,112,277	12,960,416
September	8,449,457	11,674,842
October	9,803,414	12,972,591
November	.....	14,684,883
December	.....	11,813,706
Total	108,280,388	164,496,124

SHIPMENTS OF ACETATE OF LIME

	1924 Lb.	1923 Lb.
January	9,022,250	16,261,472
February	8,548,032	13,635,149
March	9,027,539	16,490,330
April	12,460,054	14,869,803
May	8,561,412	17,937,601
June	9,261,158	13,995,065
July	7,053,405	13,145,388
August	10,995,723	7,723,885
September	10,022,960	8,227,072
October	11,883,281	12,628,153
November	.....	14,033,761
December	.....	12,144,119
Total	86,835,814	161,091,808

STOCKS OF ACETATE OF LIME

	1924 Lb.	1923 Lb.
January	23,401,511	14,142,952
February	27,622,967	14,498,522
March	32,370,329	12,901,779
April	30,534,533	11,892,803
May	33,985,853	9,007,287
June	32,291,427	9,755,803
July	23,223,659	9,767,173
August	19,335,305	14,623,749
September	17,644,160	18,054,111
October	14,996,985	18,548,830
November	.....	19,249,055
December	.....	18,799,752

Export demand for acetate of lime was not heavy, but it exceeded that for the preceding year and even with December totals lacking, outward shipments were higher than for the 12-month period of 1923. Monthly shipments for export were:

EXPORTS OF ACETATE OF LIME

	1924 Lb.	1923 Lb.
January	326,470	1,574,018
February	1,118,977	1,553,355
March	1,622,341	1,962,763
April	1,420,898	4,448,824
May	3,248,745	2,491,470
June	3,183,889	3,018,617
July	3,195,825	2,946,051
August	727,709	625,593
September	2,462,213	222,772
October	1,367,416	336,000
November	3,512,131	1,424,157
December	*	1,347,667
Total	22,187,614	21,951,287

* Figures not yet available.

Opening prices for acetate of lime were on a basis of $4 per 100 lb. Slow demand and weight of stocks brought out selling pressure and revisions to $3.50 per 100 lb. and later to $3 per 100 lb. followed. Prices for the past 6 years were within the following ranges:

	High	Low		High	Low
1924	$4.00	$3.00	1921	$2.00	$1.50
1923	4.00	3.50	1920	3.50	2.00
1922	3.50	1.75	1919	3.05	3.00

Aniline Oil Production Reduced in 1924

Production of aniline oil in 1924 was smaller than in the preceding year. Demand over the first 8 months was inactive, reflecting a rather slow movement of finished merchandise in the textile and rubber industries. A revival in buying interest set in early in the fall and before the year came to a close business improved sufficiently to steady the situation in all quarters. With no real surplus in sight at any time, prices held on an even basis, production moving at 16c. per lb., in drums, f.o.b. works. Distribution of aniline oil in the past year, according to industries, was as follows: Dyes, 40 per cent; dye intermediates, 10 per cent; rubber, 25 per cent; pharmaceuticals, 10 per cent; photographic chemicals, 10 per cent, and others 5 per cent.

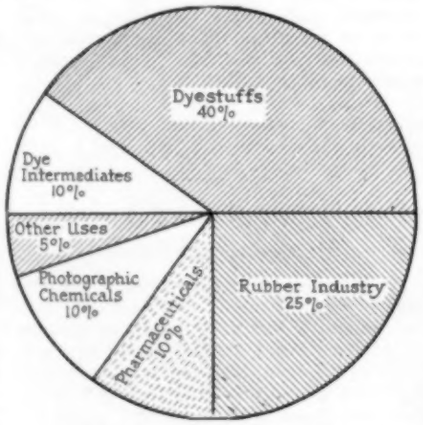
In the annual census of dyes the domestic production of aniline oil in 1923 was placed at 26,671,961 lb., which compares with 21,401,864 lb. in 1922. The high point in production was attained in 1920 when the output amounted to 39,234,186 lb.

The market for aniline salt was a featureless affair, business being slow and wholly routine in character. The quotations over the year ranged from 21@23c. per lb.

Exports of aniline oil and salt for the 11 months ended Nov. 30 amounted to 209,817 lb., valued at $70,938, which compares with 497,547 lb., valued at $95,023, for the calendar year 1923.

High and low prices for aniline oil, drums extra, f.o.b. point of production, for the past 3 years, follow:

		High	Low
1924	lb.	$0.16	$0.16
1923	lb.	.16½	.15½
1922	lb.	.17	.12



Distribution of Aniline Oil by Industries

Chile Enlarges Production of Nitrate of Soda

In the latter part of 1923 there were eighty oficinas in operation in Chile and at the close of 1924 this number had been increased to ninety-one. As this would indicate, the output of nitrate was increased and sales for the 1924-25 fertilizer year are estimated at 1,835,000 tons, as compared with 1,585,000 tons for the preceding year. These figures refer to the sales of the Producers Association and the totals do not include sales by American producers in Chile, who are estimated to have taken orders for about 100,000 tons. Of these sales about 950,000 tons is said to have been for shipment to the United States.

Imports of nitrate of soda gained in volume last year, the monthly arrivals showing the following comparisons with 1923:

IMPORTS OF NITRATE OF SODA

	1924 Tons	1923 Tons
January	159,275	109,064
February	149,603	86,302
March	115,919	121,134
April	73,219	98,577
May	73,541	107,329
June	37,440	27,873
July	50,400	58,196
August	61,798	56,637
September	68,017	51,543
October	70,454	56,788
November	65,664	30,456
December	*	87,780
Total	925,330	891,679

* Figures not yet available.

Prices for delivery over the 1924-25 nitrate year were announced in May by the Chilean Nitrate Producers Association. These prices were on a basis of English currency per metric quintal with the conversion to American money varying according to the position of sterling. July shipments were quoted at 19s. per quintal and an ascending scale of prices governed later shipment, with the highest figure of £1 0s. 9d. applying to January-May shipments. Values in the spot market were affected at times by a scarcity of stocks and ranged from $2.40 per 100 lb. to $2.65 per 100 lb.

Naphthalene Steadier on Smaller Surplus

With a surplus on hand early in the year and the demand for refined flake disappointing over the spring months, the market sagged and the average price obtained was lower than in 1923. Quite a little flake was in the hands of weak holders and liquidation resulted, which forced sales below the "market." Domestic production was curtailed and imports dwindled. In the last quarter of the year the supply situation improved and market quotations steadied. Leading producers announced contract prices for 1925, the basis being ¾c. per lb. higher than the nominal spot quotation prevailing at that time. Imports of crude material fell off fully 75 per cent compared with a year ago.

Production statistics compiled by the

Industrial Chemicals in 1924

Bureau of the Census for 1923 credit 10,936,000 lb. to byproduct coke ovens and 41,453,002 lb. to tar refiners and all other establishments. Production of all grades for the 6 years ended Dec. 31, 1923, together with the value, follows:

	Lb.	Value
1923	54,189,002	$1,006,148
1922	25,411,328	536,209
1921	19,432,987	462,502
1920	42,602,466	1,342,826
1919	20,114,243	542,565
1918	56,924,619	1,945,951

Prices for white flake for immediate delivery, in the New York market, by months, for the past 2 years, follow:

	1923		1924	
	High	Low	High	Low
January	$0.06	$0.05½	$0.06	$0.05½
February	.06½	.06	.06½	.06
March	.06½	.06½	.06	.06
April	.09	.08	.06	.05½
May	.09½	.09	.05½	.05½
June	.08½	.07½	.05	.05
July	.07½	.07	.04½	.04½
August	.07	.07	.04½	.04½
September	.07	.06½	.05	.04½
October	.06½	.06½	.05½	.05
November	.06½	.06½	.05½	.05½
December	.06	.06	.05½	.05½

Importations of naphthalene, by months, in lb., for the past 2 years, follow:

	1923	1924
January	1,694,300	625,001
February	850,608	1,611,746
March	2,492,992	1,084,008
April	1,798,425	694,084
May	2,826,925	285,906
June	1,730,436	112,000
July	3,167,958	127,047
Aug.	963,775	263,988
September	1,545,952	111,467
October	734,598	220
November	1,311,945	*
December	1,927,614	.....
Totals	21,036,458	4,915,467

* No imports in Nov., 1924.

Nitrite of Soda Helped by Increase in Duty

The outstanding feature in the market for nitrite of soda was found in a proclamation issued under date of May 6, whereby the import duty was raised from 3c. to 4½c. per lb. This was the maximum increase permitted under the flexible provisions of the tariff law and nitrite of soda was the first chemical on which such action had been taken. Prior to the change in duty, domestic production was practically at a standstill and imported material was in control of the market. When the higher tariff became effective, a radical change in conditions followed, and in the latter part of the year domestic production was on a relatively large scale and imports fell away in volume to a corresponding degree.

Consumption of nitrite of soda in 1923 showed a gain over the years immediately preceding and was estimated at about 7,000,000 lb., with 1924 consumption slightly less than that total. The greater part of the supply went into the manufacture of azo dyes. It is expected that the capacity of domestic plants will be increased so as to take care of home requirements, but as a part of the increase in duty was absorbed in a higher sales price, it is still problematical to what extent foreign-made nitrite will compete in domestic markets.

Dependence on foreign nitrite was reflected in import statistics and accounts for increased arrivals from abroad up to the latter months of the year. In August and September entry of foreign nitrite was delayed pending investigation of charges of dumping. These charges were not sustained, but were responsible for the fact that very little nitrite was admitted to this country in September and undoubtedly they had an influence in reducing the volume of shipments in the following months. A comparison of monthly imports in 1923 and in 1924, as far as official figures for the latter are available, is afforded by the following:

	1924 Lb.	1923 Lb.
January	318,519	662,787
February	337,441	465,197
March	758,433	845,651
April	842,180	652,382
May	623,640	851,258
June	1,020,492	169,850
July	1,151,375	134,583
August	46,222	391,841
September	400	123,499
October	233,403	78,537
November	33,600	226,983
December	*	82,933
Total	5,365,705	4,685,501

* Figures not yet available.

At the beginning of the year offerings of domestic nitrite were not free and market quotations were based on values for the imported grades. The latter were held at 8½@8¾c. per lb. in the spot market. Most consumers were covered ahead on contract and importers lowered prices in February to 7¾c. per lb. The market soon recovered and asking prices ranged from 8c. to 8¼c. per lb. until May, when the market strengthened under the impetus of the change in duty, although the latter did not become effective until June. In the latter half of the year values ranged from 8¾c. to 9½c. per lb. and the year closed with domestic nitrite offered at 9c. per lb. Contracts for 1925 delivery were placed at 8¾@8¾c. per lb.

The high and low prices for the past 6 years show the following fluctuations:

	High	Low		High	Low
1924	$0.09½	$0.07½	1921	$0.10	$0.06
1923	.10	.07½	1920	.30	.12
1922	.10	.06	1919	.21	.11

Cresylic Acid Depressed on Larger Stocks

Demand for cresylic acid in the disinfectant trade was not up to expectations and, with supplies ample, prices declined, closing at the low point for the year. Substitution of other products had something to do with the slump in business. With prices lower, traders look for a revival in consuming interest. Domestic requirements of cresylic acid and cresol are estimated at 10,000,000 to 12,000,000 lb. per year. Application for a reduction in the duty on cresylic acid was made, but opposition was strong and no change occurred in the tariff rate on this material. Imports of cresylic acid were large, the material arriving being of a quality that distills less than 75 per cent at a temperature of 215 deg. C. and therefore duty free under paragraph 1549 of the tariff act.

Spot quotations, high and low by months, on 97 per cent acid, for the past 2 years, follow:

	1923		1924	
	High	Low	High	Low
January	$1.00	$0.90	$0.75	$0.70
February	1.70	1.00	.73	.69
March	1.45	1.35	.70	.68
April	1.30	1.25	.68	.66
May	1.25	1.22	.65	.63
June	1.20	1.08	.65	.63
July	1.02	.90	.63	.62
August	.90	.85	.63	.61
September	.85	.75	.62	.60
October	.75	.75	.62	.60
November	.75	.70	.60	.59
December	.75	.70	.59	.59

White Lead Sharply Higher in Sympathy With Metal

Distribution of lead pigments held close to the figure established in the preceding year. Paint business was good and the trade in white lead, both dry and in oil, was generally satisfactory. A feature in the situation was the strength in the metal market. Demand for pig lead increased enormously and prices advanced sharply. The uplift in lead brought out a higher trading basis for all of the pigments. From a low point of 9½c. per lb. on standard dry white lead (basic carbonate) the market witnessed an almost unbroken advance in quotations, the closing price of 11c. per lb. being the high for the year.

Exports of white and sublimed lead in the 11 months ended Nov. 30 amounted to 8,917,885 lb., valued at $742,191, as against 9,590,721 lb., valued at $772,877, in the corresponding period in 1923.

The Bureau of the Census, in its report on paint materials, places total production of dry white lead for 1923 at 317,136,109 lb., which compares with 334,948,764 lb. in 1921. Production of lead oxides in 1923 amounted to 219,429,781 lb., as against 139,814,627 lb. in 1921.

Production of lead products for 1922 and 1923, in short tons, according to the Geological Survey, follow:

	1922	1923
White lead, dry	41,598	37,786
In oil	153,393	125,087
Sublimed, white	13,765	11,949
Blue	972	800
Red lead	30,509	38,037
Orange mineral	370	646
Litharge	58,261	75,107

High and low prices, in cents per lb., for standard dry white lead, basic carbonate, by months, for the past 2 years, follow:

	1923		1924	
	High	Low	High	Low
January	$0.08½	$0.08½	$0.09½	$0.09½
February	.09½	.08½	.09½	.09½
March	.09½	.09½	.10	.09½
April	.09½	.09½	.10½	.10
May	.09½	.09½	.10½	.10½
June	.09½	.09½	.10½	.10½
July	.09½	.09½	.09½	.09½
August	.09½	.09	.09½	.09½
September	.09½	.09	.10	.10
October	.09½	.09	.10½	.10
November	.09½	.09	.10½	.10½
December	.09½	.09	.11	.11

Industrial Chemicals in 1924

Steady Prices Ruled in Soda Ash Market

This basic chemical was affected by the slowing up that characterized many industries last year and production for the year declined about 5½ per cent from that of the preceding year. Estimates place the total output in 1924 at 1,611,000 tons. More than one-half of this total is estimated to have gone to the glass trade and to manufacturers of caustic soda, 510,000 tons to the former and 417,000 tons to the latter. Other consuming trades included chemical manufactures 160,000 tons, soap 130,000 tons, manufacture of bicarbonate of soda 99,000 tons, cleansing compounds 75,000 tons, pulp and paper 60,000 tons, water softening 50,000 tons, textiles 30,000 tons, and miscellaneous distribution 80,000 tons. Census figures showing production of soda ash in 1923 were issued last November and show the following, comparison being given with 1921:

	1923	1924
Soda ash, tons	1,707,987	959,593
Ammonia soda process, tons	1,674,234	929,448
For sale, tons	1,225,027	746,183
Value	$31,413,210	$28,316,435
Other processes, tons	33,753	30,145
For sale, tons	33,753	30,145
Value	$1,013,956	$1,030,991

Export demand was rather quiet in the first quarter of the year, but increased in volume in succeeding months. Total outward shipments were about the same in volume as those for 1923. Shipments, by months, offer the following comparisons:

EXPORTS OF SODA ASH

	1924 Lb.	1923 Lb.
January	1,582,554	2,919,108
February	1,803,668	2,236,226
March	2,076,300	2,420,934
April	2,132,040	1,812,275
May	1,811,960	2,498,887
June	2,326,172	2,464,540
July	2,143,970	2,910,738
August	2,841,138	2,360,567
September	3,026,045	2,882,562
October	3,474,914	2,348,273
November	3,838,019	2,983,399
December	*	1,186,255
Total	27,056,780	29,023,704

* Figures not yet available.

Selling prices for ash held on a steady basis throughout the year. In the latter part of the period producers announced that contract prices which had prevailed for 1924 deliveries would be continued on orders placed for 1925 business. The contract prices were on a basis of: $1.25 per 100 lb. flat, for light, 58 per cent, in bulk; $1.38 per 100 lb. flat, in bags; and $1.63 per 100 lb. flat, in bbl. Extra light, in bulk, is offered at $1.25 per 100 lb. flat, in bulk; $1.38 per 100 lb. in bags; and $1.75 per 100 lb. in bbl. Dense 58 per cent is offered at $1.35 per 100 lb. in bulk; $1.45 per 100 lb. in bags; and $1.69 per 100 lb. in bbl. A heavy contracting movement followed the announcement of these prices and producers were reported to have entered the new year with a larger amount of production sold ahead than had been the case in the preceding year.

High Prices Check Imports of Iodine

No Chilean iodine was brought into this country in 1924. When there are imports they are handled through a single firm in New York. Formerly stocks of this commodity were carried in this country, but for a long period that practice has been discontinued.

If the Nitrate Producers Association is in earnest in its avowed intention of disposing of as much as possible of its annual output of 20,000,000 kilos of iodine, it is suggested that there probably are industries in this country that would co-operate in a program of research looking to the extension of the uses of iodine. It is thought to have possibilities in connection with metallurgical and tanning processes and in the production of dyes. Before any such uses could be considered, however, there would have to be definite understanding as to price. No industry in this country is likely to co-operate in an effort to find new uses for $4 iodine.

Keen Competition Results in Lower Lithopone Prices

With production the largest on record and actual demand not up to expectations, the market for lithopone experienced a period of keen competition. New production came in, and to interest prospective buyers goods were offered at concessions. Foreign material was available in a larger way. Most of the business placed by domestic producers in the past year was at prices ranging from 6@6½c. per lb. This compares with 6½@7c. in 1923 and 6@6½c. in 1922.

The Bureau of the Census, in its biennial report on the industry, fixed production of lithopone for 1923 at 201,154,430 lb., which compares with 96,983,984 lb. in 1921.

Production and imports in short tons, according to the Geological Survey, for the 5 years ended 1923, were as follows:

	Dom. Prod.	Imports
1923	98,199	10,440
1922	83,360	10,263
1921	55,016	5,247
1920	89,737	1,714
1919	78,365	739

High and low prices for lithopone, by months, cents per lb., for the past 2 years, follow:

	1923 High	1923 Low	1924 High	1924 Low
January	$0.06½	$0.06½	$0.06½	$0.06½
February	0.06½	.06½	.06½	.06½
March	.07	.06½	.06½	.06½
April	.07	.06½	.06½	.06½
May	.07	.07	.06½	.06½
June	.07	.07	.06½	.06½
July	.07	.07	.06½	.06½
August	.07	.07	.06½	.06½
September	.07	.07	.06½	.05½
October	.07	.07	.06½	.06
November	.07	.06½	.06	.06
December	.06½	.06½	.06	.06

German Caustic Potash Control Strengthened Values

Arrivals of caustic potash from foreign countries in 1924 reached a total of about 6,000 tons. Hence it is evident that a large part of consuming requirements are filled by the foreign-made product. It is also plain that demand was on an expanding scale, since surplus stocks at the end of the year were not large and the amount imported was in excess of normal requirements. In addition to the imported caustic there was a limited home production, so that total available supplies were unusually large with an indicated consumption in excess of 6,000 tons, which compares with a pre-war consumption of 4,000 tons per year.

Imports were especially heavy in the early part of the year and in the closing months. Official returns show monthly arrivals of caustic potash as follows:

IMPORTS OF CAUSTIC POTASH

	1924 Lb.	1923 Lb.
January	1,047,210	1,005,080
February	1,356,229	345,570
March	1,113,035	832,034
April	918,849	941,519
May	792,639	1,489,354
June	870,880	1,121,677
July	756,934	226,269
August	570,791	760,149
September	802,495	683,755
October	1,677,878	670,146
November	1,571,669	915,592
December	*	1,806,209
Total	11,508,609	10,857,354

* Figures not yet available.

The most important development of the year consisted in the formation of a sales organization to represent producers in Germany. Reports to this effect reached this country in August, but at the end of the year it was stated that the German production was not entirely controlled and that offerings by independent producers prevented absolute stabilization of prices. Enough of production, however, was in the hands of the sales organization to place the latter in a position where it could restrict offerings for export and to a certain extent dictate prices on all shipments leaving the country.

Market quotations for imported caustic at the beginning of the year ranged from 6¼c. to 6½c. per lb. for spot material. Under steady demand values soon appreciated and asking prices advanced to 6½c.@6¾c. per lb. In the latter part of the year asking price showed further strength in conformity with the German markets and spot quotations went up to 7¼c.@7½c. per lb. For the greater part of the year domestic caustic was quoted above the levels asked for imported, but at the close sellers were offering at 7¼c. per lb. at works, which was under the price of importers.

Quotations for caustic potash in the spot market for the past 6 years showed the following ranges:

	High	Low		High	Low
1924	$0.07¾	$0.06½	1921	$0.28	$0.13½
1923	.08¼	.06¼	1920	.70	.29½
1922	.13½	.04¼	1919	.83	.67

Industrial Chemicals in 1924

Imported Copper Sulphate Sold at Low Prices

Trading in copper sulphate last year was enlivened by free offerings of imported makes, which came into keen competition with the domestic product. Total importations, however, were only a small percentage of the total produced in this country, but exports from this country compared unfavorably with those for the two preceding years. Market prices generally found domestic sulphate commanding a premium over the imported, but quotations for the home-made product were not on a stable basis, as there was a range according to sellers which, in part at least, was accounted for by a difference in grade. Sales of distressed lots of imported sulphate were made as low as 4c. per lb., but the lowest open quotation for spot material was 4¼c. per lb., with asking prices at times as high as 4.65c. per lb. Domestic sulphate was variously quoted from 4.40c. per lb. to 5c. per lb.

Statistics showing the import and export trade in sulphate offer the following comparisons:

FOREIGN TRADE IN COPPER SULPHATE

	Exports (Lb.)	Imports (Lb.)
January	487,046	225,340
February	502,505	600,224
March	121,235	1,087,096
April	427,589	709,476
May	32,884	94,742
June	63,037	167,032
July	65,191	161,200
August	105,979	99,257
September	183,271	243,159
October	255,673	128,400
November	309,788	167,143
Total	2,554,198	3,683,069

Domestic production of copper sulphate was smaller than in 1919, when total output was 35,287,881 lb., but it was larger than in 1921. Census figures for 1923 and 1921 were:

	1923	1921
No. of establishments	10	11
Production, lb.	32,304,421	27,221,704
Value	$1,777,663	$1,767,695
Average value, cents per lb.	5.5	6.5

Average Price of Zinc Oxide Higher in 1924

Trading early in the year suffered slightly in comparison with the corresponding period a year ago, but improvement was reported later on, and actual production held close to the 1923 total. Prices realized were higher than in 1923, reflecting firmer conditions in basic materials. Consumption of zinc oxide in the rubber industry made little or no headway, but there was a larger call for this commodity from the paint field.

According to the Bureau of the Census the output of zinc oxide in 1923 amounted to 309,669,568 lb., which compares with 117,127,315 lb. in 1921. Imports in 1923 reached the total of 3,200,000 lb., which compares with 5,500,000 lb. in 1922 and 1,886,000 lb. in 1921.

The United States Geological Survey gave out the following figures on production in this country:

Zinc oxide (short tons)	1922	1923
Lead free	128,465	126,987
Leaded	19,613	23,504

The high and low prices for American process zinc oxide, lead free, by months, in cents per lb., for the past 2 years, follow:

	1923 High	1923 Low	1924 High	1924 Low
January	$0.06½	$0.06½	$0.07½	$0.07½
February	.06½	.06½	.07½	.07½
March	.07½	.06½	.07½	.07½
April	.07½	.07½	.07½	.07½
May	.07½	.07½	.07½	.07½
June	.07½	.07½	.07½	.07½
July	.07½	.07½	.07½	.07½
August	.07½	.07½	.07½	.07½
September	.07½	.07½	.07½	.07½
October	.07½	.07½	.07½	.07½
November	.07½	.07½	.07½	.07½
December	.07½	.07½	.07½	.07½

Various Trades Offer Outlet for Silicate of Soda

There has been a marked increase in domestic production of silicate of soda in the past few years. A large part of this increase is attributed to expansion in the output of fiber, corrugated and wall boards following the greater use of paper cartons in shipping merchandise. The use of silicate of soda in fastening the flaps of these cartons also has assumed large commercial proportions. New uses also have been found for this chemical and from a production standpoint it has taken prominent rank among the soda compounds. In 1914 domestic production was 190,648 tons. This had increased in 1919 to 336,093 tons. Latest census figures give the following details for 1923 in comparison with 1921:

	1923	1921
No. of establishments	36	21
Total production, tons	696,238	276,075
For sale, tons	675,674	216,869
Value	$10,468,358	$4,641,754

Due to the general slowing up in business for a large part of 1924, production is said to have fallen below the record output for the preceding year. Estimates place the 1924 production at slightly less than 600,000 tons. In addition to the large increase in use of silicate in the manufacture of paper boards, the soap trade has shown a steady increment in requirements.

Export buying also has been along broader lines. Outward shipments last year were about on a par with those for 1923. Totals shipped each month for the past 2 years compare as follows:

EXPORTS OF SILICATE OF SODA

	1924 Lb.	1923 Lb.
January	2,084,835	1,697,002
February	1,824,756	1,770,500
March	1,984,101	3,004,390
April	2,391,275	2,733,500
May	3,057,561	2,694,312
June	3,046,222	3,366,829
July	2,708,259	2,714,872
August	3,487,013	2,472,882
September	3,042,278	2,932,327
October	3,869,344	3,882,034
November	2,996,919	3,473,076
December	*	2,361,709
Total	30,492,563	33,103,433

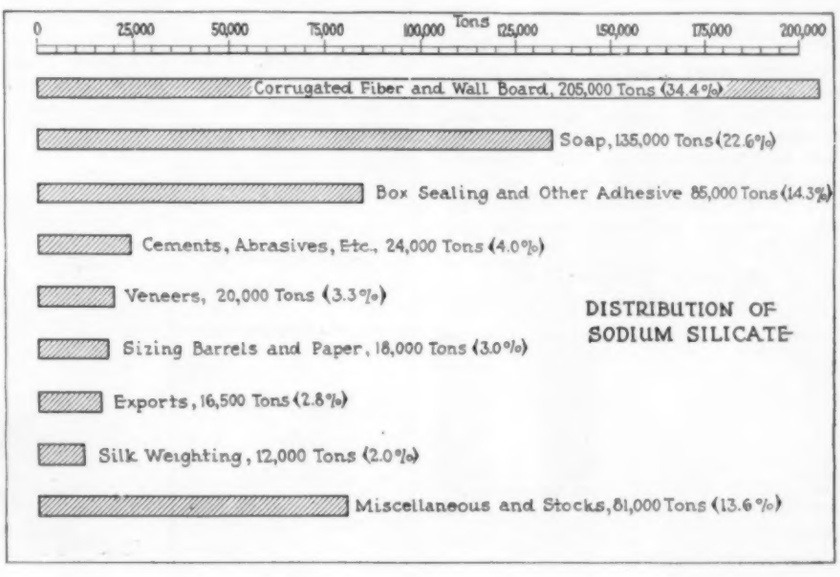
* Figures not yet available.

Market prices have varied according to strength, package and quantity, but fluctuations in values have been slight and 40 deg. silicate in tanks at works has held around 75c. per 100 lb.

Decline in Export Trade in Bichromate of Potash

Industries that are consumers of bichromate of potash, with few exceptions, were not active during the year. Export business also fell off, with a loss in excess of 1,000 tons as compared with 1923. Hence it is evident that production was on a reduced scale, and some estimates place the total domestic output at less than 3,500 tons.

In the early part of 1923 there was active buying for export, but last year there were no periodic displays of activity and export buying was mod-



Industrial Chemicals in 1924

erate throughout the period. Exports, by months, with comparisons for 1923, are shown as follows:

EXPORTS OF BICHROMATES OF POTASH

	1924 Lb.	1923 Lb.
January	68,949	269,196
February	149,310	361,321
March	87,035	1,033,857
April	73,374	240,678
May	91,167	198,883
June	73,507	127,493
July	87,269	41,517
August	127,227	146,863
September	186,509	170,156
October	56,187	307,690
November	98,475	144,207
December	*	220,899
Total	1,099,009	3,262,760

* Figures not yet available.

At the beginning of the year first hands were offering quantity lots at 9½c. per lb. The market held a fairly stable position for some months, but weakened in the latter part of the year, when sales were made as low as 8c. per lb. both for export and for home account. Prices, showing the high and low for the year enumerated, are given below:

	High	Low		High	Low
1924	$0.09½	$0.08	1921	$0.15	$0.10
1923	.11½	.09½	1920	.50	.17
1922	.10½	.09½	1919	.40	.22

Increase in Sales of Imported Tartaric Acid

With official figures lacking for December, imports of tartaric acid for the 11-month period overtop the total for all of 1923. Reports on consumption indicate a falling off. Therefore the imported acid appears to have made headway at the expense of domestic production. This is further borne out by reports that one domestic plant was closed because the owners were interested in a foreign source of supply and found it more profitable to develop the latter. Consumption in 1923 is estimated to have been about 4,100 tons. Census figures for domestic production in 1923, with comparisons for 1921, furnish the following comparisons:

	1923	1921
No. of establishments	6	5
Total production, tons	2,962	1,964
For sale, tons	2,834	1,964
Value	$1,545,387	$1,389,061

Imports were especially large in the first quarter of the year, with a good part of arrivals passing direct to consumers. Call for spot stocks was less than had been expected, with unseasonable weather given as one of the reasons for the quiet condition of the market. Detailed statistics for the past years follow:

IMPORTS OF TARTARIC ACID

	1924 Lb.	1923 Lb.
January	451,360	111,748
February	374,444	44,921
March	303,418	100,352
April	199,908	22,400
May	198,742	250,891
June	304,639	393,332
July	267,038	280,000
August	88,632	119,696
September	251,260	189,304
October	168,679	485,493
November	109,760	358,198
December	*	297,584
Total	2,717,880	2,653,919

* Figures not yet available.

Market values fluctuated within narrow limits throughout the year. Imported offerings were quoted under the domestic product, with the latter holding around the 30c. per lb. level at all times. Shipment prices for imported were firmer in the latter part of the year, and this had a steadying effect on values in the spot market. High and low prices for the past 6 years were as follows:

	High	Low		High	Low
1924	$0.30	$0.25½	1921	$0.48	$0.25
1923	.37½	.26	1920	.80	.60
1922	.31	.24	1919	.86	.65

Carbon Black Output in 1924 Increased 100 Per Cent

There was a marked gain in production of carbon black from natural gas in 1923, the increase amounting to 70,500,000 lb. Total production in 1923 amounted to 138,300,000 lb., which compares with 67,800,000 lb. in 1922. Average value of carbon black produced in 1923, according to official information, was 8.5c. per lb., against 8.6c. per lb. in 1922, 9.01c. per lb. in 1921 and 7.9c. per lb. in 1920. Statistics for production in the past 5 years are:

	Production (Lb.)	Value
1923	138,300,000	$11,692,000
1922	67,800,000	5,820,000
1921	59,800,000	5,446,000
1920	51,300,000	4,032,000
1919	52,100,000	3,816,000

Falling Off in Buying Orders for Sulphur

Domestic production of sulphur in 1923 was reported at 2,035,000 tons, which was a record output for the industry. Shipments from mines amounted to 1,618,841 tons and stocks on hand at the end of the year were 2,900,000 tons. Estimates of 1924 production place the total at 1,300,000 tons, with shipments running to about the same total, so that there was very little change in stocks as compared with the preceding year. The agreement entered into in 1923 by producers in this country and Sicily, whereby export trade was apportioned, with Sicily permitted to ship 200,000 tons abroad, was maintained throughout 1924 and will continue until the end of next September. In this connection it is noted that exports from Sicily in 1923 were 217,172 tons, of which Great Britain took 61,550 tons, Italy 31,293 tons, France 29,479 tons, Greece and Turkey 19,115 tons, Scandinavia 13,419 tons, with the remainder distributed in smaller lots among various countries.

Exports of sulphur from the United States in December were said to be large, but official figures for that month have not yet appeared and the 11-month total showed that outward shipments were about on a par with those for 1923. Exports, by months, compare as follows:

EXPORTS OF SULPHUR

	1924 Tons	1923 Tons
January	29,684	42,838
February	32,784	30,856
March	30,922	28,951
April	29,256	42,034
May	41,495	50,434
June	58,578	45,798
July	43,606	32,228
August	27,915	34,304
September	47,527	49,639
October	70,982	75,832
November	32,614	17,765
December	*	21,846
Total	445,363	472,525

*Figures not yet available.

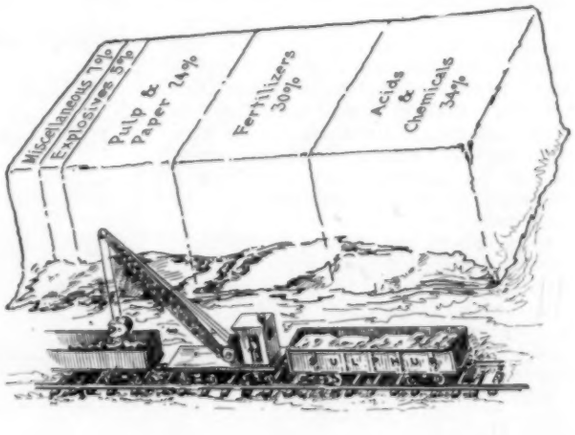
Prices for sulphur held on a fairly stable basis with quotations at the mines on a basis of $14 per ton for bulk lots. Quotations f.a.s. New York were maintained at $18 per ton in carlots.

Census figures for production of refined sulphur have just been issued. They show a material expansion in the output of that product over that for 1921. Production of sulphur-lime also gained in volume, although no figures were published in the census returns for 1921. Census figures for refined sulphur are as follows:

	1923	1921
No. of establishments	11	10
Produced for sale, tons	61,424	29,382
Value	$2,765,133	$1,599,561
Production sulphur-lime, Dry, tons	3,599	
Solution, gal.	2,471,400	
Value, dry	$468,964	
Value, solution	$357,690	

While the industries which consume the greater part of sulphur were quiet last year, the outlook for 1925 was favorable and a large increase in domestic consumption is predicted.

Distribution of Sulphur by Industries in 1924



Industrial Chemicals in 1924

Benzene Output Slumps on Less Active Steel Trade

Activity at byproduct coke ovens met with a slight setback in 1924, production being approximately 10 per cent smaller than in the preceding year. This naturally led to a reduced output of benzene. Total production of crude light oil for 1924 amounted to 120,000,000 gal., according to preliminary estimates, which compares with 135,647,175 gal. in 1923. Production of benzene, all grades, was placed at 90,000,000 gal., which compares with 97,300,000 gal. in 1923 and 70,110,000 gal. in 1922. Practically 80 per cent of the total output was consumed as motor fuel for internal combustion engines. Prices realized were lower than in 1923, because of the depression in gasoline. Quotations for motor grades are based in large part on the current market for the petroleum product, but with benzene becoming more firmly established, the tendency is to get away from this practice. Exports of benzene in the 11 months ended Nov. 30 amounted to 57,874,257 lb., valued at $1,738,906, which compares with 102,192,810 lb., valued at $3,272,194, for the corresponding period a year ago.

Production of crude light oil and derivatives in 1922 and 1923, according to the official census of dyes, follows:

	1922	1923
Crude light oil, gal.	101,437,000	135,647,175
Benzene, crude, gal.	2,666,177	4,503,428
Refined, gal.	10,419,000	12,364,043
Motor, gal.	57,025,000	80,467,883
Toluene, crude, gal.	38,159	37,777
Refined, gal.	1,955,119	2,847,519
Solvent naphtha, gal.	2,983,858	4,162,178
Other light oil prod., gal.	580,058	439,253

High and low prices for 90 per cent benzene, by months, cents per gal., tank cars, works, for the past 2 years, follow:

	1923		1924	
	High	Low	High	Low
January	$0.30	$0.27	$0.21	$0.21
February	.27	.27	.21	.21
March	.27	.27	.23	.21
April	.27	.27	.23	.23
May	.27	.26	.23	.23
June	.26	.25	.23	.23
July	.25	.25	.23	.22
August	.25	.25	.23	.22
September	.25	.24	.23	.23
October	.25	.23	.23	.23
November	.21	.21	.23	.23
December	.21	.21	.23	.23

More Phenol Available at Lower Prices

Supply and demand were more evenly balanced in 1924 and the market prices fluctuated in a less spectacular fashion. The undertone eased toward the close on freer offerings by first hands, especially for future delivery. As in the preceding year, the bulk of the output was absorbed by manufacturers of phenolic resins. Export trade was far below normal. Figures covering the 11 months ended Nov. 30 show that 50,041 lb. were exported, valued at $7,732, which compares with 229,101 lb., valued at $33,398, in the corresponding period a year ago. According to the 1923 census of dyes, etc., the production of phenol amounted to 3,310,911 lb., which compares with 1,285,978 lb. in 1922.

The range of prices for U.S.P. phenol, by months, in cents per lb., for the past 3 years, follows:

	1922		1923		1924	
	High	Low	High	Low	High	Low
Jan.	$0.11½	$0.11	$0.34	$0.28	$0.26	$0.26
Feb.	.12	.11½	.35	.34	.26	.26
March	.12½	.12	.45	.40	.28	.26
April	.13	.12½	.53	.50	.28	.26
May	.12½	.12	.55	.53	.26	.26
June	.14	.12½	.45	.42	.26	.26
July	.13	.12	.42	.30	.26	.25
Aug.	.17	.14	.30	.29	.26	.25
Sept.	.20	.17	.29	.27	.24	.24
Oct.	.28	.22	.27	.25	.24	.24
Nov.	.34	.28	.25	.24½	.24	.24
Dec.	.34	.28	.26	.25	.24	.23

Alizarin Blue Black Leads in Dye Imports

An analysis of the grades of dyes imported into this country in 1924 reveals that on a quantity basis alizarin blue black was the leader. The five dyes leading in volume of imports were:

	Lb.
Alizarin blue black	25,452
Ciba violet B	16,530
Indanthrene pink B	11,724
Indanthrene blue GCD	11,708
Indanthrene yellow	11,684

Cottonseed Oil Prices Higher in 1924

In reviewing the market on a calendar year basis the feature in the situation was the sharp upturn in prices which occurred in December. The new cotton crop, according to the official estimate, was placed at 13,153,000 bales, which compares with 10,139,000 bales in 1923. This crop should produce 5,840,000 tons of cottonseed, and on a crush of normal size, the supply of oil for the 1924-25 season is estimated at 3,100,000 bbl. The increase in the crop created much bearish feeling, but sentiment changed before much of the new oil was marketed and the advance in grains and hog products changed the whole complexion of the market. Cottonseed oil refiners regard the outlook as most promising and predict that the entire industry will profit during 1925.

The crop year that ended July 31 was not a good year for the trade. The crude mills had to pay exorbitant prices for seed early in the season and then experienced difficulty in moving crude oil at a profit. Just before the season came to a close prices for crude oil were at the lowest point. The larger cotton acreage was a depressing factor. Distribution of refined oil was smaller than in 1922-23, amounting to 2,236,000 bbl., against 2,340,000 bbl. in the preceding crop year. Average monthly consumption of refined oil was 186,300 bbl., compared with 195,000 bbl. in 1922-23. The quality of the seed marketed was below the average and the refining loss was close to 9.75 per cent, which compares with 7.50 per cent the year previous.

Distribution of refined cottonseed oil into consuming channels, by months, for the past 2 seasons, according to an analysis of the monthly statistics issued by the Bureau of the Census, follows:

	1922-3	1923-4
August (bbl.)	169,000	203,000
September	229,000	169,000
October	309,000	232,000
November	263,000	219,000
December	194,000	145,000
January	242,000	203,000
February	187,000	153,000
March	164,000	162,000
April	148,000	188,000
May	133,000	179,000
June	143,000	153,000
July	159,000	230,000
Total	2,340,000	2,236,000

Cottonseed products produced during the 1922-23 season, compared with the preceding crop year, follow:

	Season 1923-4	Season 1922-3
Crude oil, lb.	978,992,377	1,002,922,464
Refined oil, lb.	862,333,994	910,939,168
Cake and meal, tons	1,515,918	1,487,067

Stocks of cottonseed products on hand July 31 follow:

	July 31, 1924	July 31, 1923
Crude oil, lb.	4,057,676	5,103,348
Refined oil, lb.	105,946,576	138,112,489
Seed at plants, tons	21,534	12,786

Exports of cottonseed products for 12 months ended July 31, 1924, and a year ago:

	1924	1923
Crude oil, lb.	24,512,813	25,752,300
Refined oil, lb.	15,051,584	38,717,986
Cake and meal, tons	124,940	226,583

Production of cottonseed as estimated by the Department of Agriculture, and crop year receipts of cottonseed at mills, in tons, follows:

	Est. Prod.	Receipts at Mills
1924	5,840,000	.....
1923	4,476,000	3,320,648
1922	4,336,000	3,244,960
1921	3,531,000	2,923,658

High and low prices for crude cottonseed oil, f.o.b. mills, tank cars, cents per lb., immediate shipment, for the past 2 years:

	1923		1924	
	High	Low	High	Low
January	$0.09¼	$0.09¼	$0.09¼	$0.09¼
February	.10	.09¼	.09	.08¼
March	.10¼	.10¼	.08¼	.08¼
April	.10¼	.10	.08¼	.08¼
May	.10	.09¼	.08¼	.08¼
June	.10	.09¼	.08¼	.08
July	.09¼	.08¼	.11¼	.09
August	.08¼	.07¼	.11¼	.11¼
September	.10¼	.09	.09¼	.09¼
October	.10¼	.08¼	.09¼	.09
November	.10¼	.09¼	.09	.08¼
December	.09¼	.09¼	.10	.09¼

Spot prices for prime summer yellow (refined) cottonseed oil, in the New York market, in bbl., cents per lb., by months, for the past 2 years, follow:

	1923		1924	
	High	Low	High	Low
January	$11.75	$11.25	$11.75	$11.50
February	11.75	11.50	11.00	10.75
March	13.00	12.00	10.75	10.50
April	12.75	12.25	10.50	10.50
May	12.50	12.25	10.50	10.50
June	12.50	12.00	10.00	09.75
July	11.50	11.00	11.50	10.25
August	11.00	10.90	14.50	12.50
September	12.75	11.00	14.00	13.50
October	13.50	12.75	12.50	11.00
November	12.50	10.00	11.00	10.75
December	12.00	11.75	12.00	11.50

Industrial Chemicals in 1924

Soya Bean Oil Imports Reduced 75 Per Cent

With the high duty in force soya bean oil importations fell to the lowest point in recent years, the supply being 75 per cent smaller than in 1923. The decline in imports here did not affect the world's position of this commodity, as Europe absorbed all of the surplus and at relatively good prices. Production of soya beans in the United States during 1924 amounted to 9,567,000 bu., valued at $21,940,000. Practically all of the beans raised here were consumed for agricultural purposes. Production of soya beans in Manchuria in 1924 was up to the average.

Crude soya bean oil in the San Francisco market was quoted on a tank car basis, duty paid, cents per lb., by months, as follows:

	High	Low		High	Low
Jan.	$0.09½	$0.09½	July	$0.10½	$0.10
Feb.	.10	0.9½	Aug.	.10½	10½
March	.10	.10	Sept.	.10½	.10½
April	.10	.10	Oct.	.10½	.10½
May	.10	.09½	Nov.	.11½	.10½
June	.10	.09½	Dec.	.11½	.11½

Importations of crude soya bean oil, in lb., by months, with a comparison, follow:

	1923	1924
January	1,261,899	3,148
February	541,880	1,567,925
March	2,668,495	1,587,460
April	3,762,341	.....
May	12,647,370	1,866,820
June	7,492,546	40,278
July	3,758,759	188,536
August	6,779,216	414,855
September	2,145	215,929
October	689,920	.....
November	85,120	.....
December	19,000	.....
Totals	41,679,110	*8,696,692

*11 months.

Linseed Oil Supply for Crop Year Smaller

Domestic requirements of flaxseed during the crop year ended Aug. 31 amounted to 35,000,000 bl. Assuming that the yield of oil was at the rate of 2½ gal. per bu. of seed the consumption of oil amounted to 87,500,000 gal., which compares with 90,000,000 gal. in 1923 and 85,000,000 gal. in 1922. The 35,000,000 bu. of seed consumed in the crop year was arrived at as follows:

Domestic receipts, bu.	15,500,000
Imports, bu.	19,000,000
Oil imports (seed equivalent), bu.	500,000
Total	35,000,000

As much of the seed that is marketed contains impurities, and since the yield of 2½ gal. per bu. is obtained from No. 1 quality seed only, it follows that the actual production of oil was somewhat less than the figures indicate.

The moderate setback in consumption of linseed oil was attributed to the higher prices and slow trade in the early part of the year. Distribution according to industries did not change appreciably, the paint and varnish trade consuming 65 per cent of the output, the floor-covering industry 20 per cent, printing inks 10 per cent, and miscellaneous uses 5 per cent.

The outstanding development in the flaxseed situation was the gain in domestic production. The higher tariff was sufficient inducement to farmers to increase the acreage, and with fairly good crop conditions in the American Northwest, the yield turned out to be 30,173,000 bu., which compares with 17,060,000 bu. in 1923 and 10,375,000 bu. in 1922. The Canadian yield was larger than in 1923, but not to such an extent as to influence trading one way or the other. Argentine exports were of record proportions, but heavy buying to supply Europe's needs absorbed the surplus and served to maintain prices. There was no important change in the Indian crop situation. Russia raised more seed, but the surplus turned out to be too small to disturb the market; home requirements increased.

Final acreage and production figures for the United States, for the past 5 years, follow:

	Acres	Bushels
1924	3,289,000	30,173,000
1923	2,014,000	17,060,000
1922	1,113,000	10,375,000
1921	1,108,000	8,029,000
1920	1,757,000	10,774,000

High and low prices by months in the New York market for 1923 and 1924, covering carload lots, per gal., cooperage included, follow:

	1923 High	1923 Low	1924 High	1924 Low
January	$0.88	$0.86	$0.90	$0.90
February	.96	.90	.91	.90
March	1.05	.98	.93	.91
April	1.17	1.12	.90	.90
May	1.17	1.14	.90	.89
June	1.12	1.08	.94	.90
July	1.08	1.00	.94	.93
August	.98	.91	.96	.94
September	.88	.88	1.00	.98
October	.94	.90	1.02	1.00
November	.92	.89	1.00	.98
December	.91	.90	1.15	1.05

Production of flaxseed in the four leading producing countries, in bu., for the past 5 years, according to official reports, follows:

Argentina		India	
1924	*53,200,000	1924	18,480,000
1923	63,250,000	1923	21,320,000
1922	47,578,000	1922	17,443,000
1921	50,470,000	1921	10,800,000
1920	42,038,000	1920	16,760,000
Canada		**United States**	
1924	8,626,000	1924	30,173,000
1923	7,140,000	1923	17,060,000
1922	5,009,000	1922	10,375,000
1921	4,112,000	1921	8,029,000
1920	7,998,000	1920	10,774,000

* Latest estimates.

Importations of linseed oil into this country by months, with a comparison (figures given are in lb.) follow:

	1923	1924
January	106	98,130
February	64	20,411
March	189,245	83,186
April	4,525,353	202,382
May	11,357,300	193,792
June	10,156,768	373,867
July	10,862,997	2,818,583
August	4,816,354	3,654,486
September	628,102	3,913,770
October	413,213	100,192
November	47,401	33,948
December	99,811	.....
Total	43,096,714	*13,222,252

* 11 months.

Imporations of flaxseed for the 11 months ended Nov. 30, 1924, and the 12 months of 1923 (in bu.), follow:

	1923	1924
January	1,643,167	427,743
February	1,901,821	1,128,662
March	2,431,340	2,284,763
April	3,108,704	1,959,824
May	4,419,010	3,678,647
June	3,213,761	2,494,839
July	2,298,672	2,207,888
August	1,699,885	1,217,748
September	818,485	460,449
October	788,408	205,907
November	922,987	26,719
December	1,073,835	.....
Totals	24,332,329	*16,093,189

*11 months.

Argentine flaxseed shipments for the 12 months ended Dec. 31 for the past 2 years, by countries (in bu.), follow:

	1923	1924
United Kingdom	3,540,000	7,624,000
Continent	13,904,000	26,222,000
United States	20,880,000	14,503,000
To order*	5,284,000	10,330,000
Totals	43,608,000	58,679,000

*Most of the to order shipments were absorbed by the United Kingdom and the Continent.

Glycerine Higher on Advance in Raw Materials

The position of the market for glycerine improved considerably in the past year, prices realized being higher than in 1923. The advance in fats and vegetable oils had a strengthening influence on the situation, and actual demand was greater. The range of prices for crude soap lye, basis 80 per cent, in 1924 was from 10¼@12½c. per lb., loose, f.o.b. point of production. In 1923 the range of prices for this grade was 9½@11⅞c. per lb., loose, carload lots.

Imports of crude were smaller in the past year, as foreign markets were firm.

Production of crude, 80 per cent, glycerine, in the past 6 years, is estimated as follows:

	Lb.
1924	101,000,000
1923	96,545,531
1922	85,337,034
1921	63,946,751
1920	54,688,295
1919	61,792,958

Imports of crude glycerine in the 11 months ended Nov. 30 amounted to 13,350,899 lb., valued at $1,419,437, which compares with 14,211,453 lb., valued at $1,419,280, in the corresponding period a year ago.

High and low prices in cents per lb., for crude soap lye glycerine, basis 80 per cent, loose, in the New York market, for the past 2 years, follow:

	1923 High	1923 Low	1924 High	1924 Low
Jan.	$0.11½	$0.10½	$0.10½	$0.10½
Feb.	.11½	.11	.10½	.10½
Mar.	.11½	.11½	.10½	.10½
Apr.	.11	.10½	.11	.10½
May	.11½	.10½	.10½	.10½
June	.10	.09½	.10½	.10½
July	.11	.09½	.10½	.10½
Aug.	.11½	.10½	.11½	.11
Sept.	.11	.11	.12½	.12
Oct.	.11	.10½	.12½	.12½
Nov.	.11	.10½	.12½	.12½
Dec.	.11	.10½	.12½	.12½

Industrial Chemicals in 1924

Coconut Oil Consumption Shows Moderate Gain

Demand for coconut oil did not appear to be particularly good in the past year, yet figures now available indicate that the distribution was somewhat larger than in the preceding year. Production of coconut oil in this country amounted to 84,000 tons, which, added to imports of 115,000 tons, made a total of 199,000 tons. In 1923 domestic production approximated 99,000 tons, while imports amounted to 91,000 tons, a total supply of 190,000 tons of oil. Because of the change which came over the position of fats in the second half of the year prices realized were higher than in 1923. Top prices prevailed in December. A fire in one of the Pacific coast mills made the supply situation extremely tight and prices closed in a very firm position. Production of copra is largely a matter of price and operators predict that the higher market will lead to larger supplies for 1925.

Ceylon type coconut oil in the New York market in sellers' tank cars, immediate delivery, cents per lb. for the past 2 years:

	1923		1924	
	High	Low	High	Low
January	$0.08½	$0.08½	$0.08½	$0.08½
February	.08½	.08½	.08½	.08½
March	.09½	.08½	.08½	.08½
April	.09½	.09	.08½	.08½
May	.09	.08½	.08½	.08½
June	.08½	.08½	.08½	.08½
July	.08½	.08	.08½	.08½
August	.08½	.08	.09	.08½
September	.08½	.08½	.09½	.09½
October	.08½	.08½	.09½	.09½
November	.08½	.08½	.10½	.10½
December	.08½	.08½	.10½	.10½

Importations of coconut oil by months, with a comparison, the figures given being in lb., follow:

	1923	1924
January	29,900,047	10,827,385
February	22,972,423	24,493,710
March	6,876,737	12,128,619
April	14,367,641	20,081,958
May	19,510,026	11,317,811
June	18,378,646	31,878,667
July	3,478,483	11,049,776
August	10,818,574	22,800,127
September	5,669,469	14,719,364
October	11,990,365	13,297,657
November	10,874,536	28,853,208
December	24,100,168	
Totals	181,882,149	*204,691,503

* 11 months.

China Wood Oil Imports Decline in Past Year

Despite the fact that importations were smaller in 1924, the trade experienced no such shortage as occurred in the preceding year. The use of pyroxylin lacquers made further inroads as a substitute for automobile varnishes, and this restricted consumption of china wood oil to some extent. Political disturbances in China hampered the free movement of oil, yet no serious shortage was experienced at consuming centers on this account. The imports into the United States in the 11 months ended Nov. 30 amounted to 68,510,785 lb., valued at $9,507,171, which compares with 83,147,348 lb., valued at $12,708,527, in the corresponding period a year ago.

Progress was made in 1924 on the cultivation of the tung tree in Florida and it is hoped that the varnish industry, in time, will be in possession of a secondary source of supply of china wood oil.

The range of prices for china wood oil, in bbl., cents per lb., according to months, for the past 2 years, follows:

	1923		1924	
	High	Low	High	Low
January	$0.15	$0.14½	$0.21	$0.20
February	.19	.18	.20	.19
March	.32	.19	.18½	.16½
April	.40	.32	.16	.14½
May	.38	.26½	.14½	.14
June	.26	.25½	.13½	.13
July	.25½	.23	.12½	.12½
August	.23½	.22½	.14½	.13½
September	.22½	.22	.14½	.14½
October	.21½	.20½	.16½	.15½
November	.21	.20	.15½	.15½
December	.21	.21	.16	.15½

Importations of china wood oil, in pounds by months, with a comparison, follow:

	1924	1923
January	6,931,462	5,640,965
February	5,835,443	6,119,227
March	6,749,021	5,898,380
April	6,922,202	6,396,097
May	4,654,530	8,617,462
June	6,484,546	11,346,000
July	3,949,830	9,273,375
August	5,184,197	13,182,337
September	6,997,672	6,583,260
October	7,865,636	5,448,098
November	8,900,542	4,654,095
December	.....	4,144,327
Totals	*68,510,785	87,291,675

*11 months.

Revival of Trade in Rosins Results in Higher Prices

Production of turpentine during the crop year ended March 31, 1924, according to the Department of Commerce, amounted to 29,781,944 gal., which compares with 24,252,835 gal. during the crop year 1922-1923. The production of rosin in the crop year ended March 31, 1924, was placed at 1,990,865 bbl. of 500 lb. each, as against a total of 1,651,795 bbl. in the 1922-1923 period.

In 1924 the market moved into a better position for the good of the industry, especially on rosins. Export trade opened up in the second half of the year and prices for all grades of rosin advanced sharply.

The output of turpentine and rosin for the crop years ended March 31, 1924 and 1922, follows:

	1923–24	1921–22
Turpentine, total:		
Quantity (gal.)	29,781,944	24,820,620
Value	$25,326,702	$13,590,002
Rosin, total:		
Quantity (bbl., 500 lb.)	1,990,865	1,69ᵹ,971
Value	$13,392,043	$10,996,358
Distilled from crude gum:		
Turpentine:		
Quantity (gal.)	27,174,580	24,378,854
Value	$23,312,036	$13,356,790
Rosin:		
Quantity (bbl., 500 lb.)	$,790,087	1,661,624
Value	$12,023,958	$10,796,975
Distilled from wood:*		
Turpentine:		
Quantity (gal.)	†2,607,364	†441,766
Value	$2,014,666	$233,212
Rosin:		
Quantity (bbl., 500 lb.)	200,778	29,347
Value	$1,368,085	$199,383

* Statistics relate to calendar years 1923 and 1921.
† Produced by destructive process, 402,249 gal.; by steam process, 2,205,115 gal.

Stocks of turpentine and rosin on hand at the close of the past 2 crop years:

	Turp. (gal.)	Rosin (bbl.)
Total—1924	5,326,581	1,011,748
1923	3,582,768	1,132,505
At stills —1924	1,122,051	345,214
1923	609,679	474,829
Consumers—1924	934,580	264,558
1923	833,477	297,843
At wood dist. plants —1924	475,000	50,000
1923	299,712	25,063
At ports and dist. points—1924	2,794,950	351,976
1923	1,839,900	334,770

Turpentine prices in the New York market, in bbl., per gal., by months, for 1923 and 1924, follow:

	1923		1924	
	High	Low	High	Low
January	$1.54	$1.45	$0.93	$0.92
February	1.53	1.43	1.03	.96
March	1.56	1.45	1.02	1.01
April	1.60	1.40	1.01	1.00
May	1.12	1.12	.90	.89
June	1.07	.95	.88	.88
July	.94	.94	.86	.82
August	.96	.94½	.84	.82
September	.99	.98	.91	.88
October	1.01	.98	.90	.88
November	.98	.95	.87	.83
December	.93½	.92	.85	.81

Common strained rosin, high and low prices by months, for the past 2 years, per bbl., follow:

	1923		1924	
	High	Low	High	Low
January	$6.15	$6.15	$5.55	$5.55
February	6.15	6.10	5.75	5.65
March	6.15	6.10	5.80	5.75
April	6.20	6.10	5.75	5.75
May	5.90	5.85	5.60	5.50
June	5.90	5.80	5.60	5.50
July	5.80	5.80	5.50	5.45
August	5.75	5.75	5.60	5.50
September	5.85	5.75	6.15	5.80
October	5.85	5.80	7.35	6.25
November	5.80	5.70	7.60	7.45
December	5.70	5.55	7.65	7.35

Menhaden Oil Supply Cut 60 Per Cent

Poor fishing was encountered over the greater part of the 1924 season and the production of crude oil was 60 per cent smaller than in the preceding year. The fishing in the district situated to the north of Chesapeake Bay was particularly disastrous to operators of fish factories and several producers went into the hands of receivers.

Production of crude menhaden oil for the past 10 years follows:

	Bbl.		Bbl.
1924	*60,000	1919	108,500
1923	150,000	1918	79,000
1922	123,000	1917	73,500
1921	129,000	1916	78,000
1920	117,000	1915	55,000

*Estimated yield.

The monthly range of prices in 1923 and 1924 for crude oil, per gal., in tank cars, f.o.b. fish factory, follows:

	1923		1924	
	High	Low	High	Low
January	$0.50	$0.48	$0.47½	$0.47½
February	.52	.52	.47½	.47½
March	.52	.52	.47½	.47½
April	.52	.50	.50	.47½
May	.50	.50	.50	.50
June	.50	.48	.47½	.42½
July	.45	.42	.40	.38
August	.40	.38	.45	.42
September	.47½	.42	.50	.50
October	.47½	.47½	.52½	.50
November	.47½	.47½	.55	.53½
December	.47½	.47½	.55	.55

Exports of Chemicals and Allied Products—Continued

		12 Months Ended December				11 Months Ended November	
		1922		1923		1924	
		Quantity	Value	Quantity	Value	Quantity	Value
Acids and anhydrides							
Acetic	Lb.	5,080,519	$367,717	763,850	$94,025	622,006	$70,858
Sulphuric	Lb.	12,470,389	201,267	8,243,767	169,161	10,324,347	166,347
Boric	Lb.	1,968,996	197,265	891,670	104,912	627,289	67,079
All other	Lb.	9,518,087	626,057	10,671,802	667,835	9,610,795	578,263
Alcohols							
Wood and denatured	Gal.	1,270,314	922,700	1,207,023	1,275,284	605,327	626,545
Other alcohol	pf. Gal.	2,090,666	497,955	404,837	170,155	288,694	199,175
Ammonia and ammonium compounds	Lb.	7,247,480	990,111	11,343,804	1,202,976	3,117,997	846,041
Aluminum sulphate	Lb.	26,450,657	388,447	35,490,560	504,292	29,434,732	376,708
Baking powder	Lb.	3,428,395	1,515,775	4,155,725	1,762,476	3,547,212	1,367,045
Calcium compounds							
Acetate of lime	Lb.	27,596,106	591,599	21,951,287	806,857	22,186,614	705,317
Calcium carbide	Lb.	12,835,916	633,297	8,244,408	384,166	9,256,989	412,002
Bleaching powder	Lb.	41,069,188	679,775	28,828,428	525,436	19,911,902	347,336
Copper sulphate	Lb.	5,250,556	256,432	2,290,206	130,879	2,554,198	121,810
Dextrine or British gum	Lb.	16,239,474	536,027	16,206,340	626,486	20,621,081	831,699
Formaldehyde	Lb.	1,490,577	209,386	3,336,983	429,546	2,562,162	287,146
Glycerin	Lb.	2,870,463	425,891	1,767,407	318,765	1,334,836	222,541
Petroleum jelly	Lb.	7,264,256	1,254,239	8,774,513	1,164,538	8,842,912	1,096,900
Potash chlorate of	Lb.	562,986	51,066	200,178	21,995	548,765	30,189
Bichromate of	Lb.	4,430,208	433,552	3,262,760	295,751	1,099,009	92,837
Other	Lb.	7,483,175	296,378	4,532,495	188,091	1,944,328	141,908
Sodas and sodium compounds							
Cyanide	Lb.	1,250,566	235,298	5,005,952	473,675	4,020,903	454,713
Borax	Lb.	17,242,571	867,417	40,498,964	1,606,054	30,734,245	1,467,597
Soda Ash	Lb.	29,627,574	678,983	29,023,704	729,870	27,056,780	642,129
Silicate	Lb.	29,131,925	302,511	33,103,433	316,543	30,492,563	281,966
Sal soda	Lb.	11,463,418	186,284	12,224,131	179,006	12,439,853	190,652
Caustic	Lb.	146,739,406	5,271,528	114,683,728	3,827,403	83,495,952	2,602,578
Bicarbonate	Lb.	15,853,945	341,385	16,934,348	387,861	13,992,608	305,646
Other sodium compounds	Lb.	97,518,488	2,439,288	148,763,626	2,407,509	85,250,573	1,797,631
Washing powder and fluid	Lb.	3,425,471	201,852	5,732,091	307,900	3,982,016	238,304
Other chemicals, medicinal and pharmaceutical	Lb.	76,817,513	7,430,704	79,438,052	7,120,204	68,499,935	6,695,040
Pigments, paints and varnishes			11,477,863		16,551,716		13,025,320
Mineral with pigments, ocher, umber, sienna, metallic, whiting, etc	Lb.	27,631,228	981,905	28,584,484	999,177	25,746,901	739,189
Chemical pigments							
Zinc oxide	Lb.	7,953,847	593,128	10,047,408	743,577	7,007,784	542,029
Lithopone	Lb.	3,231,722	169,982	2,970,743	176,624	1,689,873	96,553
Bone black	Lb.	2,056,593	117,014	3,018,530	181,383	1,863,992	115,042
Carbon and lamp black	Lb.	17,062,311	2,028,105	29,020,743	4,723,166	30,982,015	3,064,438
Red lead and litharge	Lb.	3,366,375	294,133	3,680,663	372,828	1,739,948	193,677
White and sublimed lead	Lb.	9,196,656	710,765	10,344,089	836,275	8,917,885	742,191
Other chemical pigments	Lb.	4,296,792	367,146	6,561,780	633,239	4,902,001	577,265
Paints, stains and enamels							
Enamel paints	Lb.	1,501,520	418,521	2,128,074	582,019	1,753,910	442,427
Other ready-mixed paints	Gal.	1,337,393	2,734,325	1,838,330	3,736,725	1,832,098	3,661,999
Other paints	Lb.	10,188,393	1,720,360	11,502,947	1,934,444	7,672,100	1,358,717
Varnishes							
Oil varnishes	Gal.	376,416	657,117	558,097	1,005,441	611,480	1,043,852
Other varnishes	Gal.	352,331	533,844	408,005	626,818	261,731	447,941
Fertilizers and fertilizer materials	Ton	935,008	16,648,372	1,096,612	20,557,992	976,884	15,410,037
Sulphate of ammonia	Ton	147,331	8,736,611	150,544	10,874,627	112,201	6,574,954
Phosphate materials							
Phosphate rock							
High grade hard rock	Ton	202,300	2,548,587	194,339	2,477,501	139,735	1,695,792
Land pebble	Ton	512,777	3,369,179	630,565	3,273,006	593,936	2,924,646
Other phosphate rock	Ton	4,217	40,401	2,641	21,664	11,469	92,459
Superphosphates (acid phosphate)	Ton	24,373	360,402	42,156	541,460	39,347	506,818
Prepared fertiliser mixtures	Ton	14,416	690,972	17,997	832,948	33,798	1,603,442
Other fertilizers	Ton	25,189	882,966	45,073	1,921,972	42,541	1,778,072
Explosives	Lb.	19,212,449	3,400,391	21,407,708	3,535,705	17,504,722	2,625,729
Smokeless powder	Lb.	925,840	369,848	1,699,406	567,519	291,209	134,792
Other gunpowder	Lb.	410,705	129,216	402,401	186,705	463,539	145,167
Blasting powder	Lb.	3,227,956	366,686	1,449,634	120,111	2,249,117	166,000
Dynamite	Lb.	14,105,017	2,406,398	16,982,676	2,482,562	13,640,793	1,999,617
Other explosives	Lb.	417,623	73,976	873,591	178,808	860,064	180,153
Soap							
Toilet or fancy	Lb.	7,565,881	2,869,007	7,369,539	3,002,480	5,006,694	2,229,428
Laundry	Lb.	67,079,838	4,694,406	66,498,491	4,701,141	50,236,502	3,531,743
Other soap	Lb.	14,173,788	1,349,697	18,456,371	1,583,011	15,844,804	1,370,883
Perfumery and toilet waters	Lb.	726,489	504,167	655,750	562,385	365,649	370,197
Talcum and other toilet powders	Lb.	3,652,604	1,397,674	3,814,379	1,671,588	3,018,791	1,570,851
Creams, rouges, and other cosmetics	Lb.	2,071,263	966,133	2,148,663	1,093,747	2,165,740	1,130,711
Dentifrices	Lb.	4,026,935	2,403,497	2,983,088	2,439,427	2,849,592	2,586,505
Other toilet preparations	Lb.	1,849,063	1,037,929	1,849,415	1,111,536	1,493,811	1,101,761
Pyroxylin products, known as celluloid, pyralin, viscoloid, fiberloid, etc	Lb.						
In blocks, sheets, or rods	Lb.	1,225,033	1,494,372	1,940,071	2,346,798	1,774,488	1,848,850
Manufacturers of	Lb.	635,986	880,166	637,856	921,897	729,994	1,001,630
Blackings and polishes	Lb.						
Shoe polishes	Lb.	5,173,840	1,188,552	5,435,300	1,213,631	5,283,063	1,238,004
Other blackings and polishes	Lb.	3,913,206	567,932	2,620,038	446,095	2,237,755	425,481
Clays							
Fire clay		21,778	169,664	44,692	303,675	35,118	289,705
Other clays		18,923	240,068	31,107	329,192	24,804	389,451
Graphite							
Unmanufactured	Lb.	1,138,708	78,094	1,815,292	138,542	1,907,858	134,915
Manufactures of	Lb.	2,028,423	255,019	2,081,041	335,778	1,425,004	234,043
Metal polishes	Lb.	3,602,952	400,186	2,264,728	281,674	3,177,358	369,173
Asbestos							
Unmanufactured	Ton	336	49,939	607	48,525	1,028	77,488
Paper, millboard and rollboard	Lb.	2,298,621	122,746	3,559,848	190,755	1,970,027	110,694
Pipe covering and cement	Lb.	3,417,707	224,352	5,667,731	426,085	4,576,914	270,178
Textiles, yarn and packing	Lb.	668,204	492,422	1,037,786	672,488	1,101,264	726,815
Other manufactures of asbestos, except roofing	Lb.	3,166,824	658,227	3,249,762	800,623	2,592,373	747,583
Carbons, carbon brushes and electrodes	Lb.	14,645,307	1,098,094	30,222,887	2,317,495	29,297,305	2,800,533
Chalk, manufacturers of	Lb.	1,272,354	209,018	1,225,340	150,679	882,949	109,56
Gypsum or plaster, crude, ground, calcined, and manufactures of	Lb.	15,345,725	178,166	17,629,808	226,423	19,869,563	330,852
Fire clay bricks	M	30,961	1,407,175	44,896	1,744,778	22,215	665,019
Other refractory bricks	M	3,577	236,096	5,152	447,380	11,720	1,052,901
Refractory shapes	Lb.	10,142,064	174,504	27,350,054	612,324	29,772,817	709,706
Crucibles	No.	355,155	92,273	463,265	132,228	534,815	82,501
Nickel, monel metal and alloys	Lb.	913,983	196,702	868,158	307,269	1,657,748	480,851
Bauxite	Ton	19,617	961,208	78,560	3,380,486	69,118	3,410,442

Exports of Chemicals and Allied Products

		12 Months Ended December				11 Months Ended November	
		1922		1923		1924	
		Quantity	Value	Quantity	Value	Quantity	Value
Animal oils							
Oleo oil	Lb.	109,386,571	$11,464,837	98,954,904	$11,841,001	93,408,976	$13,192,088
Lard oil	Lb.	699,791	80,043	735,590	88,414	454,317	53,570
Neatsfoot oil	Lb.	1,147,511	175,875	1,144,812	198,171	1,725,842	260,209
Whale oil	Lb.	583,270	53,061	722,530	31,138	44,114	7,766
Other animal oils	Lb.	1,959,620	189,690	1,514,821	165,467	1,200,732	143,470
Fish oils—							
Cod and cod-liver oil	Gal.	60,989	70,581	33,415	59,752	283,076	65,137
Other fish oil	Lb.	4,697,895	195,071	749,797	77,355	373,732	35,742
Oleo stock	Lb.	15,596,285	1,523,464	10,300,600	1,172,756	13,411,018	1,656,868
Tallow, edible	Lb.	2,375,803	193,205	1,204,303	99,786	987,663	87,909
Tallow, inedible	Lb.	29,000,472	2,017,557	34,671,935	2,872,904	31,486,985	2,661,731
Lard	Lb.	766,950,103	91,484,669	1,035,381,571	130,171,943	867,291,937	113,361,840
Lard compounds	Lb.	16,286,169	1,952,187	7,450,591	1,014,653	6,909,243	955,089
Stearins and fatty acids—							
Oleo and lard stearin	Lb.	10,678,056	1,049,692	8,765,194	941,989	6,073,856	689,658
Grease stearic	Lb.	3,406,737	277,215	3,520,096	333,196	2,848,583	288,192
Oleic acid, or red oil	Lb.	3,590,298	290,482	1,728,091	143,954	2,542,699	211,392
Stearic acid[1]	Lb.	5,036,253	480,838	2,709,120	352,915	1,740,486	208,295
Other fatty acids	Lb.			153,798	15,264	279,584	23,389
Oleo margarine, animal	Lb.	1,843,407	298,487	1,792,436	293,357	722,317	116,349
Other greases, oils and fats	Lb.	57,472,065	4,048,618	60,675,870	5,380,813	73,318,042	6,585,028
Glue, animal origin	Lb.	2,708,654	418,759	2,510,108	386,029	2,066,684	330,937
Beeswax	Lb.	100,674	27,699	118,456	36,218	91,224	30,433
Wax manufactures	Lb.	1,618,748	314,472	1,748,551	334,218	1,512,580	310,129
Oil cake and meal	Lb.	926,301,302	19,897,594	917,454,494	19,838,284	1,042,534,480	22,012,629
Coconut cake	Lb.	7,960,197	106,057	1,577,940	35,328	1,644,454	36,449
Corn cake	Lb.	1,766,689	31,097	15,746	502		
Cottonseed cake	Lb.	331,311,165	7,066,212	292,263,128	6,773,018	310,657,865	6,499,188
Linseed cake	Lb.	422,865,573	9,524,980	532,617,638	11,058,112	570,597,288	12,117,274
Penaut cake	Lb.	14,513,060	154,565	672,000	11,760		
Other oil cake	Lb.	3,172,090	55,161	2,471,604	49,825	952,757	17,105
Cottonseed meal	Lb.	117,656,619	2,416,446	52,162,800	$1,136,747	132,373,793	2,824,997
Linseed meal	Lb.	17,997,571	404,906	32,081,988	699,777	19,817,489	415,324
Other oil-meal	Lb.	9,058,338	138,170	3,591,650	73,223	6,490,834	102,292
Oilseeds	Lb.	3,836,352	140,590	2,583,798	137,232	2,921,808	190,391
Vegetable oils expressed, and fats							
Peanut oil	Lb.	963,102	100,691	203,485	18,657	38,557	4,065
Linseed oil	Lb.	2,702,634	332,781	3,013,216	407,863	2,238,450	296,093
Soy-bean oil	Lb.	2,458,080	207,288	1,356,220	139,557	2,196,726	244,270
Corn oil	Lb.	5,732,993	678,180	4,361,100	558,834	3,445,775	461,846
Cocoa butter	Lb.	1,199,969	359,782	762,371	215,247	748,208	189,627
Vegetable oleomargarine	Lb.	333,756	47,769	1,745,414	240,778	118,316	19,061
Vegetable oil lard compounds	Lb.	25,478,494	2,968,705	9,616,686	1,338,834	6,493,353	904,049
Vegetable soap stock	Lb.	8,134,462	438,343	3,814,986	257,393	4,890,171	267,546
Other vegetable oils and fats	Lb.	6,369,664	669,142	8,508,711	976,133	5,079,935	647,260
Naval stores							
Rosin	Bbl.	799,174	7,488,348	1,205,649	11,057,980	1,323,721	12,293,153
Spirits of turpentine	Gal.	9,369,403	10,152,620	11,478,459	12,303,809	10,563,834	9,281,853
Wood turpentine	Gal.	494,576	342,430	393,811	405,870	531,043	420,524
Turpentine substitutes	Gal.			844,952	358,103	925,172	324,578
Tar and pitch wood	Bbl.	31,520	159,173	74,692	375,761	49,295	252,404
Other gums and resins	Lb.	1,657,680	367,760	2,079,080	676,232	1,911,674	673,984
Dye extracts							
Logwood extract	Lb.	2,626,103	448,713	1,954,098	264,207	1,307,787	168,258
Other dye extracts	Lb.	2,614,110	459,861	2,298,788	322,663	1,525,528	202,947
Dyeing and tanning materials, crude	Ton	1,497	138,726	1,442	90,579	2,003	85,112
Tanning extracts—							
Chestnut	Lb.	7,911,316	253,815	8,714,834	307,579	8,573,238	267,833
Other tanning extracts (vegetable and chemical)	Lb.	22,612,678	1,051,163	23,466,809	1,172,094	20,967,175	1,042,332
Starch—							
Cornstarch	Lb.	339,226,525	7,749,375	195,020,108	5,895,139	246,025,661	7,880,337
Other starch	Lb.	23,945,909	580,319	9,215,033	320,452	3,216,953	144,942
Vegetable stearin	Lb.	1,447,896	148,632	253,666	34,609	77,942	13,338
Vegetable glue	Lb.	891,860	98,121	774,877	85,451	853,818	71,559
Mineral oils							
Petroleum, crude	Gal.	419,793,896	18,348,110	716,551,862	23,111,816	699,856,228	24,996,136
Petroleum, ref	Gal.	2,502,871,738	312,563,476	3,270,638,102	326,599,065	3,598,951,746	360,851,915
Gas and fuel oil	Gal.	697,219,404	25,959,704	1,228,594,295	35,708,049	1,332,369,152	45,542,080
Paraffin wax							
Unrefined	Lb.	83,516,957	2,418,300	94,316,692	2,769,448	86,475,594	3,794,195
Refined	Lb.	200,983,844	6,976,604	235,475,857	8,657,857	264,741,052	13,005,956
Lime	Bbl.	82,893	116,649	117,887	170,289	140,598	200,269
Sulphur	Ton	485,664	7,095,628	472,525	7,105,260	445,363	7,183,028
Salt	Lb.	269,977,554	1,429,172	251,057,170	1,211,226	273,538,037	1,216,649
Zinc dust	Lb.	3,995,124	287,890	7,357,049	507,289	4,169,553	321,434
Coal-tar products			7,621,808		12,331,666		9,435,809
Crudes							
Benzol	Lb.	64,740,402	2,362,821	111,336,768	3,647,660	57,874,257	1,738,906
Crude tar and pitch	Bbl.	102,150	214,055	513,834	1,694,494	267,685	1,068,074
Other crudes	Lb.	5,289,029	154,983	9,060,704	300,257	12,930,841	414,991
Intermediates							
Carbolic acid	Lb.	223,146	23,223	232,830	34,389	30,041	7,732
Aniline oil and salts	Lb.	341,220	65,602	497,457	95,023	209,817	70,938
Naphthalene	Lb.	109,514	12,657	95,164	10,386	108,426	12,960
Other intermediates	Lb.	878,114	172,898	1,218,183	243,060	1,488,017	220,342
Finished products—							
Coal-tar colors, dyes, and stains	Lb.	8,352,437	4,001,145	17,924,536	5,565,371	14,691,495	5,256,435
Medicinals	Lb.	554,166	224,546	237,975	164,160	246,672	278,121
Photographic chemicals	Lb.	248,119	103,853	214,160	96,317	162,281	75,633
Other coal-tar finished products, n. e. s	Lb.	5,673,243	286,025	4,527,146	480,549	2,021,937	291,677
Medicinal and pharmaceutical preparations—							
Quinine, sulphate and other salts of cinchona	Oz.	355,181	219,534	392,328	166,736	294,463	152,373
Antitoxins, serums, and vaccines	C.C.		399,617	11,151,218	418,711	30,108,066	987,822
Other medicinal and pharmaceutical preparations	Lb.	30,249,353	13,575,687	34,583,318	15,591,301	459,051	584,230
Crude drugs, essential oils, dyeing, and tanning materials (total)			6,449,722		6,712,371		6,828,791
Drugs, herbs, leaves, and roots, crude—							
Ginseng	Lb.	202,722	2,334,993	148,385	2,245,258	136,189	1,995,255
Other crude vegetable drugs	Lb.	3,919,912	878,636	5,961,533	1,297,964	7,054,552	1,519,480
Essential oils—							
Peppermint	Lb.	128,606	298,743	123,212	366,273	166,883	780,246
Other	Lb.	1,056,497	585,072	637,705	645,754	1,045,100	767,328
Glass, window, common	Box	32,333	176,267	50,682	256,243	38,980	175,304
Glass, plate	Sq.Ft.	2,875,223	1,156,617	1,981,767	843,792	1,603,944	475,108
Glass, window, etc	Lb.	1,975,211	225,851	3,397,376	375,412	1,906,596	202,762
Chemical glassware	Lb.	276,509	154,696	247,443	175,801	222,267	178,863

Imports of Chemicals and Allied Products

		12 Months Ended December				11 Months Ended November	
		1922		1923		1924	
		Quantity	Value	Quantity	Value	Quantity	Value
Albumen, egg	Lb.	6,569,546	$2,066,981	7,046,229	$2,711,676	2,677,110	$2,118,086
Animal and fish oils, fats and greases:							
Whale oil	Gal.	48,277	17,162	3,977,003	2,068,038	4,945,301	2,445,432
Cod and cod-liver oil	Gal.	1,809,478	855,563	2,396,565	1,334,684	2,436,136	1,364,204
Other fish oils	Gal.	44,091	10,913	716,750	225,997	710,807	239,565
Beef and hog fats	Lb.	2,127,763	151,830	11,373,792	879,167	3,071,945	279,175
Grease and oils, n.e.s.	Lb.	11,042,968	1,230,250	10,426,801	552,010	11,627,618	339,937
Gelatin, edible	Lb.	702,059	223,543	3,125,406	911,270	.....	213,598
other	Lb.	490,856	216,487	2,021,555	952,923	2,971,626	584,874
Glue and glue size	Lb.	5,794,046	699,335	7,228,255	648,261	1,716,904	1,060,316
Casein	Lb.	14,342,498	1,367,828	26,489,992	4,409,744	6,864,019	555,736
Beeswax and other animal wax	Lb.	3,182,714	687,742	3,182,714	687,742	15,762,701	1,234,520
Oil cake and meal:							
Bean	Lb.	4,282,420	87,683	31,223,638	545,297	43,557,613	810,079
Coconut	Lb.	33,584,131	1,044,314	63,007,150	671,635	65,537,835	864,443
All other	Lb.	8,048,521	143,582	29,893,212	547,547	37,244,937	648,427
Vegetable tallow	Lb.	7,706,106	1,220,922	9,738,939	1,382,210	7,172,477	1,180,767
Vegetable wax	Lb.	.....	548,099	17,769,735	1,906,168	10,067,351	1,133,864
Varnish, gums and resins:							
Copal, damar and kauri	Lb.	29,053,463	3,327,740	.....	.....	.....	.....
Damar	Lb.	2,006,721	344,129	11,484,136	1,482,168	8,384,895	915,441
Kauri	Lb.	2,406,639	415,752	8,917,337	2,018,187	5,652,444	1,040,687
Shellac	Lb.	25,162,510	14,915,636	38,446,775	22,955,251	22,457,513	11,989,193
All other	Lb.	8,273,882	871,674	36,794,233	3,962,114	24,341,309	3,301,053
Tar, pitch, and turpentine	Lb.	.....	27,142	.....	69,926	.....	125,708
Gum, Arabic	Lb.	8,191,736	798,010	9,857,703	1,239,788	7,066,544	735,980
Tragacanth	Lb.	238,924	142,484	1,203,218	590,438	772,199	279,883
Gambier	Lb.	9,003,374	433,307	6,321,653	442,816	4,026,546	403,217
All other	Lb.	9,957,219	1,363,848	8,756,136	959,419	6,520,292	652,734
Oil seeds:							
Cotton seed	Lb.	39,783,718	303,249	68,841,666	946,208	83,348,578	1,252,373
Castor beans	Lb.	81,673,345	2,409,385	88,539,307	3,040,858	77,633,751	3,379,664
Copra	Lb.	252,697,857	9,303,817	332,974,498	13,477,469	261,652,808	11,520,818
Flaxseed	Bu.	14,913,161	31,106,603	24,332,329	48,956,956	16,093,189	28,858,169
Poppy seed	Lb.	3,316,023	292,099	6,548,607	658,411	4,716,410	393,324
Other oil seeds, free	Lb.	6,540,525	282,688	25,581,173	1,150,944	22,492,375	947,337
duty	Lb.	.....	.....	9,900,009	350,786	4,794,521	166,042
Vegetable oils and fats:							
China wood oil	Gal.	10,825,949	7,891,251	11,638,890	13,397,000	Lb. 68,510,785	9,507,171
Coconut oil, free	Lb.	221,163,918	15,937,757	178,788,397	12,710,739	204,599,516	15,684,123
duty	Lb.	.....	.....	3,093,752	235,459	91,927	8,506
Cocoa butter	Lb.	8,291,964	2,068,185	418,393	98,016	1,784,035	310,098
Olive oil, edible	Lb.	61,186,645	11,811,146	77,190,457	12,217,505	71,233,640	11,762,847
inedible	Gal.	3,571,706	1,963,589	5,413,938	3,393,701	Lb. 23,755,520	2,070,530
Palm oil	Lb.	57,516,079	3,771,098	128,494,679	9,339,481	87,508,792	5,923,502
Peanut oil	Lb.	2,469,938	281,492	8,008,622	759,904	15,038,212	1,278,384
Linseed oil	Lb.	144,136,792	10,927,671	2,124,330	1,423,431	13,222,252	1,063,784
Soya bean oil	Lb.	17,294,094	1,013,173	41,679,110	2,680,200	8,696,692	538,729
Other vegetable oils, free	Lb.	.....	206,864	8,547,617	588,773	10,067,351	1,133,864
duty	Lb.	.....	.....	2,201,474	169,464	6,255,266	460,512
Dyeing and tanning materials (vegetable):							
Logwood	Ton	33,096	616,462	36,431	659,995	13,749	227,399
Mangrove bark	Ton	3,478	87,379	5,886	160,078	2,189	46,606
Myrobalans	Ton	4,130	86,880	27,165	594,521	8,477	187,353
Quebrachowood	Ton	54,107	627,970	24,236	382,436	24,588	335,092
Sumac	Ton	5,527	281,723	6,963	414,737	3,309	345,720
Valonia	Lb.	986	72	16,450,341	334,446	14,986,075	220,736
Other crude	Lb.	.....	1,023,733	75,829,206	1,383,069	47,989,397	842,353
Extracts for dyeing, etc.	Lb.	3,151,801	214,030	4,714,969	343,512	2,840,597	275,536
Extracts for tanning:							
Quebracho	Lb.	100,564,987	4,189,061	135,498,346	4,508,237	79,712,263	2,160,696
All other	Lb.	7,207,222	251,974	6,036,726	171,280	6,716,007	183,627
Starch	Lb.	8,014,490	534,623	13,382,414	420,538	11,472,218	423,280
Mineral oil:							
Crude petroleum	Gal.	5,346,953,774	70,383,309	3,444,631,182	53,882,278	3,021,231,157	67,799,399
Lubricating, illuminating fuel oil, and unfinished products	Gal.	115,405,578	7,547,058	.....	.....	.....	.....
Fuel oils	Gal.	123,778,279	1,656,788	513,502,937	7,526,360	496,738,047	11,369,648
Tops and distillates	Gal.	49,142,561	2,257,766	32,988,174	1,690,259	12,132,867	810,688
Gasoline, naphthas	Gal.	72,551,801	5,959,109	190,894,393	14,803,170	130,314,145	11,766,554
Illuminating oil	Gal.	146,450	40,576	301,483	55,657	3,277,492	226,739
Lubricating oils	Gal.	1,808,169	341,057	1,219,083	196,366	428,936	80,264
Paraffin and paraffin wax	Lb.	7,447,213	299,480	12,843,022	559,087	12,360,954	617,891
Asphalt and bitumen	Ton	111,302	1,000,463	129,138	1,079,906	133,521	1,094,164
Lime and limestone crude	100 lb.	115,997	73,248	507,139	428,909	42,982,037	364,712
Kaolin, china and paper clay	Ton	276,968	2,966,805	279,166	3,050,099	289,181	2,946,065
Other clays	Ton	48,000	492,281	67,656	619,727	74,215	733,613
Chalk, unmanufactured	Ton	133,417	5,169,801	122,983	175,730	96,191	118,192
manufactures of	Lb.	.....	109,503	9,462,492	122,866	15,768,187	132,564
Pyrites or sulphuret of iron	Ton	269,947	1,136,548	259,926	1,248,980	219,639	535,033
Talcum, steatite, French chalk	Lb.	36,527,970	371,329	38,811,812	409,600	33,602,253	331,315
Salt	100 lb.	2,276,245	523,036	172,069,989	1,132,113	189,765,898	326,473
Mineral wax	Lb.	8,989,972	371,161	5,000,597	216,906	2,722,572	192,456
Chrome ore	Lb.	201,781,310	741,186	128,763	1,123,120	112,927	1,033,363
Aluminum ore, crude bauxite	Ton	27,448	154,546	119,020	593,882	194,985	877,216
Antimony ore	Lb.	.....	.....	2,094,095	44,721	1,630,852	56,004
Quicksilver	Lb.	168,119	101,865	1,568,551	901,031	796,403	450,647
Zinc dust	Lb.	.....	75,393	66,044	16,714	124,178	23,112
Chemicals and allied products, free	...	.....	63,126,239	.....	86,522,790	.....	82,218,896
(total) duty	...	.....	37,477,505	.....	36,871,605	.....	29,116,522
Chemicals (total)	...	.....	41,419,660	.....	47,100,600	.....	39,278,082
Coal-tar chemicals (total)	...	.....	11,012,769	.....	17,273,682	.....	18,519,434
Coal-tar products, crude:							
Benzene and toluene	Lb.	316,765	7,284	896,561	29,864	363,742	12,632
Dead or creosote oil	Gal.	41,567,537	4,240,449	64,199,636	10,071,393	82,790,763	12,598,287
Naphthalene	Lb.	3,144,332	54,029	21,036,458	578,563	4,915,467	91,285
Tar and pitch	Bbl.	24,853	58,517	14,775	46,825	15,762	47,984
Other crude coal-tar products	...	.....	380,122	.....	807,641	.....	457,611
Intermediates—							
Acids	Lb.	760,163	119,843	80,505	94,269	263,801	71,638
Other intermediate products	Lb.	1,376,566	302,310	2,598,281	513,692	3,179,575	655,061
Finished products:							
Alizarin and derivatives	Lb.	479,858	701,943	290,130	403,612	151,554	214,247
Colors or dyes, n.e.s.	Lb.	2,553,576	3,762,841	.....	.....	3,017,690	3,885,352

Imports of Chemicals and Allied Products—Continued

		12 Months Ended December				11 Months Ended November	
		1921		1922		1923	
		Quantity	Value	Quantity	Value	Quantity	Value
Anthracene and carbazole colors and dyes	Lb.	17,697	$26,002	8,319	$8,976	.....	.....
Color lakes	Lb.	239	262	4,263	3,635	.....	.....
Indigo—							
Natural	Lb.	12,450	13,848	10,473	5,216	151,554	$214,247
Synthetic	Lb.	72,218	101,448	631	458	.....	.....
Dyes, colors, stains, etc	Lb.	872	1,482	13,809	18,174	.....	.....
Colors, dyes, stains, color acids, and color bases, n.e.s.	Lb.	738,359	1,006,924	3,252,382	4,424,311	3,017,690	3,885,352
Imported from—							
Germany	Lb.	.....	.....	1,580,403	1,945,814	.....	.....
Switzerland	Lb.	.....	.....	857,466	1,331,075	.....	.....
United Kingdom	Lb.	.....	.....	108,410	111,969	.....	.....
Other countries	Lb.	.....	.....	706,103	1,035,453	.....	.....
Coal-tar medicinals	Lb.	.....	208,670	68,127	212,255	83,931	233,126
Other finished coal-tar products	Lb.	.....	19,961	14,885	51,303	12,079	13,963
Other chemicals:							
Acids and anhydrides—							
Arsenious acid or white arsenic	Lb.	1,704,963	132,568	21,149,545	1,985,400	17,051,655	1,548,169
Citric	Lb.	112,686	40,442	820,370	250,845	688,624	190,883
Formic	Lb.	255,397	18,113	1,275,705	95,405	1,370,981	110,351
Oxalic	Lb.	1,294,236	106,627	2,629,297	206,861	2,663,346	154,827
Sulphuric	Lb.	1,260,000	12,222	23,508,494	198,083	14,597,265	124,954
Tartaric	Lb.	628,972	171,567	2,653,919	641,597	2,717,880	559,366
All other	free Lb.	2,430,128	87,296	1,716,584	17,916	352,941	4,686
	dut Lb.	5,480,222	1,242,983	2,580,966	347,639	2,333,643	300,556
Alcohols, including fusel oil		.....	14,867	.....	1,239,358	.....	444,792
Ammonia compounds, n.e.s.—							
Muriate of ammonia	Lb.	81,662	16,448	6,056,902	325,179	8,442,189	389,034
Nitrate	Lb.	7,936,714	417,159	19,915,953	1,297,924	3,690,988	206,289
All other	Lb.	8,299,267	450,764	1,874,439	104,977	1,718,530	72,316
Arsenic sulphide (realgar and orpiment)	Lb.	7,630,519	472,044	2,194,540	268,311	460,938	44,051
Barium compounds	Lb.	3,854,736	148,235	7,954,717	298,737	13,558,470	343,665
Cobalt oxide	Lb.	47,950	94,590	258,574	511,903	201,451	393,166
Copper sulphate	Lb.	.....	.....	.....	.....	3,683,069	155,239
Lime—							
Chlorinated, or bleaching powder	Lb.	8,534,709	135,673	1,395,545	50,532	1,140,221	49,713
Citrate	Lb.	15,981,682	2,222,795	1,672,604	200,143	2,272,003	233,525
Glycerin	Lb.	3,657,068	354,369	15,142,802	1,507,664	13,350,899	1,419,437
Iodine, crude	Lb.	352,557	1,024,609	274,238	887,460	.....	.....
Potassium compounds—							
Cyanide	Lb.	3,088,108	253,072	2,464,462	199,261	2,748,598	221,239
Carbonate	Lb.	10,008,325	386,140	10,949,977	579,095	5,518,576	213,702
Hydroxide	Lb.	11,537,067	643,891	10,857,354	686,710	11,508,609	637,217
Nitrate	Ton	2,438	141,521	2,747	137,228	587	43,8[illegible]
Bitartrate, crude, argols	Lb.	22,965,618	1,709,184	19,803,621	1,512,011	14,734,658	964,942
Cream of tartar	Lb.	.....	.....	.....	.....	1,496,882	162,091
Potassium chlorate and perchlorate	Lb.	.....	.....	.....	.....	6,816,618	284,359
Other potassium compounds	Lb.	12,179,888	757,404	23,171,018	1,684,311	5,450,739	386,537
Sodium compounds—							
Cyanide	Lb.	15,705,924	1,306,071	29,645,744	2,435,299	27,593,591	2,406,642
Ferrocyanide	Lb.	1,198,064	220,506	1,147,171	186,601	2,980,111	253,387
Nitrate	Lb.	1,548,738	62,407	4,685,501	209,026	4,307,440	170,241
All other, n.e.s.	free Lb.	.....	74,759	29,873,807	466,666	15,161,590	153,782
	dut	.....	1,129,258	.....	940,854	.....	383,104
All other chemicals, n.e.s.	free	.....	5,043,015	.....	1,288,547	.....	712,177
	dut	.....	4,705,919	.....	3,447,734	.....	2,002,739
Paints, pigments, and varnishes (total)		.....	3,674,396	.....	3,306,920	.....	2,571,640
Mineral earth pigments—							
Ochers and siennas	dut Lb.	5,350,906	97,956	21,022,483	343,938	18,690,431	233,826
Other	dut Lb.	19,108,814	255,532	78,657,524	994,704	67,690,978	750,854
Chemical pigments—							
Zinc pigments	dut Lb.	27,845,363	1,290,329	22,690,529	948,018	15,252,764	720,886
All other	dut	.....	155,203	.....	551,623	.....	447,034
Paints, stains, and enamels	dut Lb.	443,815	113,684	1,016,684	389,337	1,000,237	349,344
Varnishes	dut Gal.	6,166	24,969	21,621	79,300	22,627	69,696
Fertilizers (total)	Ton	1,340,440	45,122,574	1,857,866	63,881,361	1,694,573	61,045,781
Nitrogeneous—							
Calcium cyanamid	Ton	41,807	2,236,474	68,532	3,672,398	62,942	3,070,973
Calcium nitrate	Ton	1,097	46,508	9,211	366,340	4,741	217,789
Sodium nitrate	Ton	542,464	26,152,723	891,679	41,955,770	927,308	44,591,633
Sulphate of ammonia	Ton	4,890	260,172	3,539	204,624	5,226	297,457
Guano	Ton	.....	.....	.....	.....	21,257	637,396
Dried blood	Ton	.....	.....	.....	.....	5,894	327,766
Tankage	Ton	.....	.....	.....	.....	26,948	638,717
Phosphate—							
Bone phosphate	Ton	32,274	860,683	56,326	1,732,749	20,157	651,900
Other phosphate material	Ton	4,831	70,912	11,010	149,895	22,796	256,526
Potash fertilizers—							
Chloride, crude (muriate of potash)	Ton	161,546	5,549,852	135,497	4,116,180	115,257	3,546,976
Sulphate, crude	Ton	57,719	2,429,416	63,578	2,576,469	59,414	2,354,218
Kainite	Ton	149,857	1,023,330	160,211	924,131	138,675	830,320
Manure salts	Ton	195,005	1,948,608	273,344	2,957,503	174,768	1,710,584
Other potash-bearing substances	Ton	3,295	41,740	32,826	412,111	28,454	310,834
All other fertilizers	Ton	100,002	2,714,714	34,612	943,959	35,444	613,618
Explosives:							
Azides, fulminates, dynamite, etc., and powder from country imposing duty		.....	.....	.....	.....		39,833
Firecrackers	Lb.	791,521	93,696	4,298,893	567,610	5,123,673	806,324
Fireworks and ammunition	Lb.	421,442	120,882	563,407	134,989	434,651	91,511
Soap:							
Castile	Lb.	2,703,888	341,298	1,861,576	187,228	1,663,611	199,971
Toilet	Lb.	219,393	73,497	903,314	280,999	861,792	295,612
All other	Lb.	2,125,398	498,582	2,572,248	257,149	1,889,954	207,876
Perfume materials	Lb.	.....	494,698	.....	1,290,382	.....	1,216,585
Cosmetics, powders, creams	Lb.	375,775	235,636	1,348,584	711,050	967,634	678,408
Cellulose products	Lb.	55,207	9,732	308,800	59,982	1,253,149	1,565,265

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

Industrial Chemicals

Acetone, drums, works	lb.	$0.12 –	$0.12½
Acetic anhydride, 85 %, dr	lb.	.36 –	.38
Acid, acetic, 28%, bbl.	100 lb.	3.12 –	3.37
Acetic, 56%, bbl.	100 lb.	5.85 –	6.10
Acetic, 80%, bbl.	100 lb.	8.19 –	8.44
Glacial, 99½%, bbl.	100 lb.	11.01 –	11.51
Boric, bbl.	lb.	.09 –	.09½
Citric, kegs	lb.	.45½–	.46½
Formic, 85%	lb.	.10½–	.10½
Gallic, tech.	lb.	.45½–	.47
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.13½–	.14
22% tech., light, bbl.	lb.	.06½–	.07
Muriatic, 18° tanks	100 lb.	.80 –	.85
Muriatic, 20°, tanks	100 lb.	.95 –	1.00
Nitric, 36°, carboys	lb.	.04 –	.04½
Nitric, 42°, carboys	lb.	.04½–	.05½
Oleum, 20%, tanks	ton	16.00 –	17.00
Oxalic, crystals, bbl.	lb.	.10½–	.11
Phosphoric, 50% carboys	lb.	.07½–	.07½
Pyrogallic, resublimed	lb.	1.55 –	1.60
Sulphuric, 60°, tanks	ton	8.00 –	9.00
Sulphuric, 60°, drums	ton	12.00 –	13.00
Sulphuric, 66°, tanks	ton	13.00 –	14.00
Sulphuric, 66°, drums	ton	17.00 –	18.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.27½–	.28
Tartaric, domestic, bbl.	lb.	.29 –	.30
Tungstic, per lb.	lb.	1.20 –	1.25
Alcohol, butyl, drums, wks.	lb.	.27 –	.30
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.89 –	.....
Denatured, 190 proof No. 1, special bbl.	gal.	.61 –	.....
No. 1, 190 proof, special, dr.	gal.	.55 –	.....
No. 1, 188 proof, bbl.	gal.	.65 –	.....
No. 1, 188 proof, dr.	gal.	.58 –	.....
No. 5, 188 proof, bbl.	gal.	.60 –	.....
No. 5, 188 proof, dr.	gal.	.55 –	.....
Alum, ammonia, lump, bbl.	lb.	.03½–	.04
Potash, lump, bbl.	lb.	.02½–	.03½
Chrome, lump, potash, bbl.	lb.	.05½–	.06
Aluminum sulphate, com., bags	100 lb.	1.40 –	1.45
Iron free, bags	lb.	2.40 –	2.45
Aqua ammonia, 26°, drums	lb.	.06½–	.06¾
Ammonia, anhydrous, cyl.	lb.	.28 –	.30
Ammonium carbonate, powd., tech., casks	lb.	.12½–	.12¾
Nitrate, tech., casks	lb.	.09 –	.10
Amyl acetate tech., drums	gal.	3.25 –	3.50
Antimony oxide, white, bbl.	lb.	.14½–	.16
Arsenic, white, powd., bbl.	lb.	.05½–	.06
Red, powd., kegs	lb.	.14½–	.15½
Barium carbonate, bbl.	ton	54.00 –	55.00
Chloride, bbl.	ton	63.00 –	68.00
Dioxide, 88% drums	lb.	.17½–	.18
Nitrate, casks		.07½–	.08
Blanc fixe, dry, bbl.	lb.	.03½–	.03¾
Bleaching powder, f.o.b. wks., drums, contract	100 lb.	1.90 –	.....
Spot, wks., drums	100 lb.	2.00 –	2.15
Borax, bbl.	lb.	.05 –	.05½
Bromine, cases	lb.	.44 –	.45
Calcium acetate, bags	100 lb.	3.00 –	3.05
Arsenate, dr.	lb.	.08 –	.08½
Carbide, drums	lb.	.05 –	.05½
Chloride, fused, dr. wks.	ton	21.00 –	.....
Gran. drums works	ton	27.00 –	.....
Phosphate, mono, bbl.	lb.	.06½–	.07½
Carbon bisulphide, drums	lb.	.06 –	.06½
Tetrachloride, drums	lb.	.06½–	.07½
Chalk, precip.—domestic, light, bbl.	lb.	.04½–	.04½
Imported, light, bbl.	lb.	.04½–	.05
Chlorine, liquid, tanks, wks.	lb.	.04½–	.....
Contract, tanks, wks.	lb.	.04 –	.....
Cylinders, 100 lb., wks.	lb.	.05½–	.07½
Cobalt, oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	15.00 –	16.00
Copper carbonate, bbl.	lb.	.16½–	.17
Cyanide, drums	lb.	.49 –	.50
Oxide, kegs	lb.	.16½–	.16¾
Sulphate, dom., bbl.	100 lb.	4.65 –	4.75
Imp. bbl.	100 lb.	4.55 –	.....
Cream of tartar, bbl.	lb.	.20½–	.21
Epsom salt, dom., bbl.	100 lb.	1.75 –	2.00
Imp., tech., bags	100 lb.	1.35 –	1.40
U.S.P., dom., bbl.	100 lb.	2.10 –	2.35
Ether, U.S.P., dr concent'd.	lb.	.15 –	.16
Ethyl acetate, 85%, drums	gal.	.92 –	.95
Acetate, 99% dr.	gal.	1.08 –	1.10
Formaldehyde, 40%, bbl.	lb.	.09 –	.09½
Fullers earth—f.o.b. mines	ton	7.50 –	18.00
Furfural, works, bbl.	lb.	.23 –	.....
Fusel oil, ref., drums	gal.	4.00 –	4.50
Crude, drums	gal.	3.00 –	3.25
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Imp., bags	100 lb.	.80 –	.90
Glycerine, c. p., drums extra	lb.	.19 –	.19½
Crude 80%, loose	lb.	.12½–	.13
Hexamethylene, drums	lb.	.65 –	.67

THESE prices are first-hand quotations in the New York market for industrial chemicals, coal-tar products and related materials used in the industries that produce

Dyes	**Paper and Pulp**
Paint and Varnish	**Petroleum**
Ceramic Materials	**Soap**
Fertilizers	**Explosives**
Rubber	**Food Products**
Sugar	**Metal Products**

Whenever available these prices are those of the American manufacturer. If for material f.o.b. works or on a contract basis, quotations are so designated. All prices refer to large quantities in original packages.

Lead:			
White basic carbonate, dry, casks	lb.	$0.12 –	.....
White, basic sulphate, casks	lb.	.11½–	.....
White, in oil, kegs	lb.	.1376–	.....
Red, dry, casks	lb.	.1375–	.....
Red, in oil, kegs	lb.	.1497–	.....
Acetate, white crys., bbl.	lb.	.15½–	.....
Brown, broken, casks	lb.	.14½–	.....
Arsenate, white crys., bbl.	lb.	.16 –	$0.18
Lime-Hydrated, b.g., wks.	ton	10.50 –	12.50
Bbl., wks.	ton	18.00 –	19.00
Lump, bbl. 280	lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.13½–	.....
Lithopone, bags	lb.	.06 –	.06½
Magnesium carb., tech., bags	lb.	.07 –	.08
Methanol, 95%, drums	gal.	.70 –	.72
97%, drums	gal.	.72 –	.74
Pure, tanks	gal.	.74 –	.76
drums	gal.	.78 –	.80
bbl.	gal.	.83 –	.85
Methyl-acetone, t'ks.	gal.	.70 –	.....
Nickel salt, double, bbl.	lb.	.10 –	.....
Single, bbl.	lb.	.10½–	.....
Orange mineral, cak	lb.	.16½–	.17
Phosgene		.60 –	.75
Phosphorus, red, cases	lb.	.70 –	.75
Yellow, cases	lb.	.37½–	.40
Potassium bichromate, casks	lb.	.08½–	.08½
Bromide, gran., bbl.	lb.	.42 –	.48
Carbonate, 80–85%, calcined, casks	lb.	.06 –	.06½
Chlorate, powd.	lb.	.06½–	.08½
Cyanide, drums	lb.	.47 –	.52
First sorts, cask	lb.	.08½–	.08½
Hydroxide (caustic potash) drums	lb.	.07½–	.07½
Iodide, cases	lb.	3.65 –	3.75
Nitrate, bbl.	lb.	.06 –	.07½
Permanganate, drums	lb.	.14½–	.14½
Prussiate, red, casks	lb.	.38 –	.38½
Prussiate, yellow, casks	lb.	.18½–	.18½
Salammoniac, white, gran., casks, imported	lb.	.06 –	.06½
White, gran., bbl., domestic	lb.	.07 –	.07½
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl. 100	lb.	1.20 –	1.40
Salt cake (bulk) works	ton	16.00 –	18.00
Soda ash, light 58% flat, bulk, contract 100	lb.	1.25 –	.....
bags, contract 100	lb.	1.38 –	.....
Dense, bulk, contract, basis 58% 100	lb.	1.35 –	.....
bags, contract 100	lb.	1.45 –	.....
Soda, caustic, 76%, solid, drums contract 100	lb.	3.10 –	.....
Caustic, ground and flake, contracts, dr. 100	lb.	3.50 –	3.85
Caustic, solid, 76% f.a.s. N. Y. 100	lb.	2.95 –	3.05
Sodium acetate, works, bbl.	lb.	.05 –	.05½
Bicarbonate, bulk 100	lb.	1.75 –	.....
Bichromate, casks	lb.	.06½–	.06¾
Bisulphate (niter cake)	ton	6.00 –	7.00
Bisulphite, powd., U.S.P., bbl.	lb.	.04½–	.04½
Bromide, bbl.	lb.	.43 –	.47
Chlorate, kegs	lb.	.06½–	.06¾
Chloride long	ton	12.00 –	13.00
Cyanide, cases	lb.	.19 –	.22
Flouride, bbl.	lb.	.08½–	.09
Hyposulphite, bbl.	lb.	.02½–	.02½
Nitrite, casks	lb.	.09 –	.09½
Peroxide, powd., cases	lb.	.23 –	.27
Phosphate, dibasic, bbl.	lb.	.03 –	.03½
Prussiate, yel. bbl.	lb.	.10½–	.10½
Salicylate, drums	lb.	$0.38 –	$0.40
Silicate (40°, drums) 100	lb.	.75 –	1.16
Silicate (60°, drums) 100	lb.	1.75 –	2.00
Sulphide, fused, 60-62%, drums	lb.	.02½–	.03½
Sulphite, crys., bbl.	lb.	.03½–	.03½
Strontium nitrate, powd., bbl	lb.	.09½–	.10
Sulphur chloride, yel drums	lb.	.04½–	.05
Crude	ton	18.00 –	19.00
At mine, bulk	ton	14.00 –	16.00
Flour, bag 100	lb.	2.25 –	2.35
Dioxide, liquid, cyl.	lb.	.08 –	.08½
Tin bichloride, bbl.	lb	.16½–	.....
Oxide, bbl.	lb.	.61 –	.....
Crystals, bbl.	lb.	.40½–	.....
Zinc carbonate, bags	lb.	.12 –	.14
Chloride, gran., bags	lb.	.06 –	.07½
Cyanide, drums	lb.	.40 –	.41
Dust bbl.	lb.	.08 –	.08½
Oxide, lead free, bags	lb.	.07½–	.....
5% lead sulphate bags	lb.	.06½–	.....
French, red seal, bags	lb.	.09½–	.....
French, green seal, bags	lb.	.10½–	.....
French, white seal, bbl.	lb.	.11½–	.....
Sulphate, bbl. 100	lb.	3.50 –	3.75

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 –	$0.62
Alpha-naphthol, ref., bbl.	lb.	.75 –	.80
Alpha-naphthylamine, bbl.	lb.	.35 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salt, bbl.	lb.	.22 –	.23
Anthracene, 80%, drums	lb.	.65 –	.70
Anthraquinone, 25%, drums	lb.	.65 –	.67
Benzaldehyde U.S.P., tech., drums	lb.	.69 –	.71
Benzene, pure, tanks, works	gal.	.25 –	.....
Benzene, 90%, tanks, works	gal.	.23 –	.....
Benzidine base, bbl.	lb.	.78 –	.80
Benzyl chloride, ref. carboys	lb.	.35 –	.....
Benzyl chloride, tech., drums	lb.	.25 –	.....
Beta-naphthol, tech., bbl.	lb.	.24 –	.25
Beta-naphthylamine, tech.	lb.	.65 –	.70
Cresylic acid, 97%, drums	gal.	.59 –	.62
95-97%, drums, works	gal.	.55 –	.57
Dichlorbenzene, drums	lb.	.07 –	.08½
Dinitrobenzene, bbl.	lb.	.15 –	.17½
Dinitrochlorbenzene, bbl.	lb.	.20 –	.21
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluen, bbl.	lb.	.18 –	.20
Dip oil, 25%, drums	gal.	.26 –	.28
H-acid, bbl.	lb.	.70 –	.74
Meta-phenylenediamine, bbl.	lb.	.90 –	.95
Monochlorbenzene, drums	lb.	.08½–	.10
Naphthalene, flake, bbl.	lb.	.05 –	.05½
Naphthionate of soda, bbl.	lb.	.60 –	.65
Naphthionic acid, crude, bbl.	lb.	.60 –	.62
Nitrobenzene, drums	lb.	.09 –	.09½
Nitro-naphthalene, bbl.	lb.	.25 –	.27
Nitro-toluene, drums	lb.	.13½–	.14
N-W acid, bbl.	lb.	1.10 –	1.15
Ortho-amidophenol, kegs	lb.	2.40 –	2.50
Ortho-dichlorbenzene, drums	lb.	.10 –	.11
Ortho-toluidine, bbl.	lb.	.17 –	.18
Para-aminophenol, base, kegs	lb.	1.15 –	1.20
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Para-nitraniline, bbl	lb.	.65 –	.67
Para-nitrotoluene, bbl.	lb.	.40 –	.42
Para-phenylendiamine, bbl.	lb.	1.25 –	1.35
Para-toluidine, bbl.	lb.	.70 –	.75
Phenol, U.S.P., dr.	lb.	.23 –	.25
Picric acid, bbl.	lb.	.20 –	.22
Pitch, tanks, works	ton	27.00 –	30.00
Pyridine, imp., drums	gal.	4.10 –	4.20
Resorcinol, tech., kegs	lb.	1.30 –	1.40
Resorcinol, pure, kegs	lb.	2.00 –	2.25
R-salt, bbl.	lb.	.50 –	.55
Salicylic acid, tech., bbl.	lb.	.32 –	.33
Salicylic acid, U.S.P., bbl.	lb.	.35 –	.....
Solvent naphtha, water-white, tanks	gal.	.24 –	.25
Crude, tanks	gal.	.21 –	.22
Sulphanilic acid, crude, bbl.	lb.	.16 –	.18
Tolidine, bbl.	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars, works	gal.	.26 –	.....
Toluene, drums, works	gal.	.31 –	.....
Xylidine, drums	lb.	.40 –	.42
Xylene, 5 deg.-tanks	gal.	.36 –	.40
Xylene, com., tanks	gal.	.24 –	.26

Naval Stores

Rosin B-D, bbl. 280	lb.	$8.15 –	$8.25
Rosin E-I, bbl. 280	lb.	8.20 –	8.30
Rosin K-N, bbl. 280	lb.	8.30 –	8.40
Rosin W.G.-W.W., bbl. 280	lb.	9.50 –	10.25
Turpentine, spirits of, bbl.	gal.	.92 –	.93
Wood, steam dist., bbl.	gal.	.80 –	.81
Wood, dest. dist., bbl.	gal.	.72 –	.73
Pine tar pitch, bbl. 200	lb.	5.50 –	.....
Tar, kiln burned, bbl. 500	lb.	12.00 –	12.50
Rosin oil, first run, bbl.	gal.	.45 –	.....
Pine tar oil, com'l.	gal.	.30 –	.....

Animal Oils and Fats

Degras, bbl.	lb.	$0.03½ –	$0.05½
Grease, yellow, loose	lb.	.09½ –	.09¾
Lard oil, Extra No. 1, bbl.	gal.	.96 –	.98½
Lard compound, bbl.	lb.	.13½ –	.14
Neatsfootoil, 20 deg. bbl.	gal.	1.35 –	1.37
Oleo Stearine		.11 –	.....
Oleo oil, No. 1, bbl.	lb.	.15½ –	.16
Red oil, distilled, d.p. bbl.	lb.	.11 –	.11½
Tallow, extra, loose works	lb.	.10½ –	.....
Tallow oil, acidless, bbl.	gal.	.92 –	.94

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.17 –	$0.17½
Castor oil, No. 1, bbl.		.17½ –	.17¾
Chinawood oil, bbl.	lb.	.15½ –	.15¾
Coconut oil, Ceylon, bbl.	lb.	.11½ –	.11¾
Ceylon, tanks, N. Y.	lb.	.10½ –	.10¾
Corn oil, crude, bbl.	lb.	.12 –	.....
Crude, tanks, (f.o.b. mill)	lb.	.10½ –	.....
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.09½ –	.09¾
Summer yellow, bbl.	lb.	.11½ –	.11¾
Linseed oil, raw, car lots, bbl.	gal.	1.15 –	.....
Raw, tank cars (dom.)	gal.	1.09 –	.....
Boiled, cars, bbl. (dom.)	gal.	1.17 –	.....
Olive oil, denatured, bbl.	gal.	1.18 –	1.22
Sulphur, (foots) bbl.	lb.	.09¾ –	.09¾
Palm, Lagos, casks	lb.	.09¾ –	.09¾
Niger, casks	lb.	.08¾ –	.09
Palm kernel, bbl.	lb.	.10¼ –	.10¾
Peanut oil, crude, tanks (mill)	lb.	.11¼ –	.11½
Refined, bbl.	lb.	.16 –	.16½
Perilla, bbl.	lb.	.14½ –	.14¾
Rapeseed oil, refined, bbl.	gal.	.96 –	.96½
Sesame, bbl.	lb.	.15 –	.15½
Soya bean (Manchurian), bbl	lb.	.13 –	.....
Tank, f.o.b. Pacific Coast	lb.	.11¼ –	.11½

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.64 –	$0.66
Menhaden, light pressed, bbl.	gal.	.70 –	.72
White bleached, bbl.	gal.	.72 –	.74
Crude, tanks (f.o.b. factory)	gal.	.55 –	....
Whale No. 1 crude, tanks, coast	lb.	..... –	....
Winter, natural, bbl.	gal.	.75 –	.76
Winter, bleached, bbl.	gal.	.78 –	....

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.50 –	$0.55
Albumen, egg, tech, kegs	lb.	.90 –	.95
Cochineal, bags	lb.	.33 –	.35
Cutch, Borneo, bales	lb.	.04½ –	.05
Rangoon, bales	lb.	.13 –	.13½
Dextrine, corn, bags 100	lb.	4.67 –	4.87
Gum, bags 100	lb.	4.94 –	5.07
Divi-divi, bags	ton	42.00 –	43.00
Fustic, sticks	ton	30.00 –	35.00
Chips, bags	lb.	.04 –	.05
Gambier com., bags	lb.	.17½ –	.18
Logwood, sticks	ton	25.00 –	26.00
Chips, bags	lb.	.02½ –	.03
Sumac, leaves, Sicily, bags	ton	165 00 –	175.00
Domestic, bags	ton	50.00 –	55.00
Starch, corn, bags 100	lb.	4.02 –	4.29

Extracts

Archil, conc., bbl.	lb.	$0.16 –	$0.19
Chestnut, 25% tannin, tanks	lb.	.01½ –	.02½
Divi-divi, 25% tannin, bbl.	lb.	.05 –	.05
Fustic, liquid, 42°, bbl.	lb.	.08 –	.09½
Gambier, liq., 25% tannin, bbl.	lb.	.13½ –	.14
Hematine crys., bbl.	lb.	.14 –	.18
Hemlock, 25% tannin, bbl.	lb.	.03½ –	.04
Hypernic, liquid, 51°, bbl.	lb.	.12 –	.13
Logwood, crys., bbl.	lb.	.14 –	.15
Liq., 51°, bbl.	lb.	.07½ –	.08½
Osage Orange, 51°, liquid, bbl.	lb.	.07 –	.08
Quebracho, solid, 65% tannin, bbl.	lb.	.04½ –	.04¾
Sumac, dom., 31°, bbl.	lb.	.06½ –	.06¾

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, contract	lb.	$0.06 –	$0.08
spot, bags	lb.	.08 –	.12
Lampblack, bbl.	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues–Prussian, bbl.	lb.	.35 –	.37
Ultramarine, bbl.	lb.	.08 –	.35
Browns, Sienna, Ital., bbl.	lb.	.05 –	.12
Sienna, Domestic, bbl.	lb.	.03 –	.03½
Umber, Turkey, bbl.	lb.	.04 –	.04½
Greens-Chrome, C.P.Light, bbl.	lb.	.30 –	.32
Chrome, commercial, bbl.	lb.	.11 –	.12
Paris, bulk	lb.	.24 –	.26
Reds, Carmine No. 40, tins	lb.	4.25 –	4.50
Iron oxide red, casks	lb.	.08 –	.12
Para toner, kegs	lb.	.95 –	1.00
Vermilion, English, bbl.	lb.	1.45 –	1.50
Yellow, Chrome, C.P. bbls.	lb.	.20 –	.22
Ocher, French, casks	lb.	.02 –	.03

Waxes

Beeswax, crude, Afr. bg.	lb.	$0.38 –	$0.39
Refined, light, bags	lb.	40 –	.41
Candellila, bags	lb.	.32 –	.33
Carnauba, No. 1, bags	lb	.37 –	.38
No. 2, North Country, bags	lb.	.30 –	.31
No. 3, North Country, bags	lb.	.24½ –	.25
Japan, cases	lb.	$0 16 –	$0 16½
Montan, crude, bags	lb.	.06 –	.06½
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.06½ –	.06¾
Crude, scale 124-126 m.p. bags	lb.	.05½ –	.....
Ref., 118-120 m.p. bags	lb.	.06 –	.06½
Ref., 123-125 m.p., bags	lb.	.06½ –	.06¾
Stearic acid, sgle. pressed, bags	lb.	.12½ –	.13
Double pressed, bags	lb.	.13½ –	.14

Fertilizers

Acid phosphate, 16% wks.	ton	$7.50 –	$7.75
Ammonium sulphate, bulk f.o.b. works 100	lb.	2.75 –	.....
Blood, dried, bulk	unit	3.85 –	3.95
Bone, raw, 3 and 50, ground	ton	26.00 –	28.00
Fish scrap, dom., dried, wks.	unit	5.00 –	.....
Nitrate of soda, bags 100	lb.	2.62 –	.....
Tankage, high grade, f.o.b. Chicago	unit	3.10 –	3.20
Phosphate rock, f.o.b. mines			
Florida pebble, 68-72%	ton	3.00 –	3.50
Tennessee, 75%	ton	6.50 –	6.75
Potassium muriate, 80%, bags	ton	34.55 –	.....
Sulphate, bags, 90%	ton	45.85 –	.....
Double manure salt, bgs.	ton	26.35 –	.....
Kainit, 14%, bgs	ton	10.25 –	.....

Crude Rubber

Para—Upriver fine	lb.	$0.36 –	.....
Upriver coarse	lb.	.28 –	.....
Plantation—First latex crepe	lb.	.35 –	.....
Ribbed smoked sheets	lb.	.35 –	.....

Gums

Copal, Congo, amber, bags	lb.	$0.08 –	$0.10
East Indian, bold, bags	lb.	.13 –	.14
Manila, amber, bags	lb.	.14 –	.16
Damar, Batavia, cases	lb.	.28½ –	.28¾
Singapore, No. 1, cases	lb.	.30½ –	.31½
Singapore, No. 2, cases	lb.	.21 –	.21½
Kauri, No. 1, cases	lb.	.58 –	.64
Ordinary chips, cases	lb.	.21 –	.22
Manjak, Barbados, bags	lb.	.06 –	.12

Shellac

Shellac, orange fine, bags	lb.	$0.65 –	$0.66
Orange superfine, bags	lb.	.67 –	.68
Bleached, bonedry	lb.	.73 –	.74
T. N., bags	lb.	.62 –	.63

Miscellaneous Materials

Asbestos, crude No. 1 f.o.b., Quebec sh. ton		$325 00–	$400.00
Shingle, f.o.b., Quebec sh. ton		45.00 –	50.00
Cement, f.o.b., Quebec sh. ton		15.00 –	20.00
Barytes, grd., white, f.o.b. mills, bbl. net ton		17.00 –	17.50
Grd., off-color, f.o.b., Balt net ton		13.00 –	14.00
Floated, f.o.b., St. Louis, bbl. net ton		23.00 –	24.00
Crude f.o.b. mines, bulk net ton		8.00 –	8 50
Casein, bbl., tech. lb		.10½ –	.12
China clay (kaolin) crude, No. 1, f.o.b. Ga. net ton		6.50 –	8.00
Powd., f.o.b. Ga. net ton		12.00 –	15.00
Crude, f.o.b. Va. net ton		5.50 –	7 00
Ground, f.o.b. Va. net ton		10.00 –	20.00
Imp., powd. net ton		45 00 –	50.00
Feldspar, No. 1 f.o.b. N.C. long ton		6.50 –	7.25
No. 2 f.o.b. N.C. long ton		4.50 –	5 00
No. 1 gr'd. Me. long ton		19.00 –	20.00
No. 1 Can., f.o.b., mill, powd. long ton		25.00 –	.....
Graphite, Ceylon, lump, first quality, bbl.	lb.	.07 –	.07½
High grade amorphous crude	ton	15.00 –	35.00
Gum arabic, amber, sorts, bags	lb.	.13 –	.13½
Tragacanth, sorts, bags	lb.	.50 –	.55
No. 1, bags	lb.	1.15 –	1.20
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N.Y.	ton	50.00 –	55.00
Magnesite, calcined	ton	35.00 –	42.50
Pumice stone, imp., casks	lb.	.03 –	.40
Dom., lump, bbl.	lb.	.06 –	.08
Dom., ground, bbl.	lb.	.03 –	.05
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.25
Sand blast, f.o.b. Ind.	ton	2.25 –	3.50
Amorphous, 200-mesh, f.o.b. Ill.	ton	20.00 –	.....
Glass sand, f.o.b. Ill.	ton	2.00 –	2.25
Soapstone, coarse, f.o.b., Vt., bags	ton	7.00 –	7.50
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	10.50 –	.....
200 mesh, f.o.b., Ga	ton	7.50 –	10.00
325 mesh, f.o.b. New York, grade A	ton	14.75 –	.....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$3.00 –	$3.10
Corning	bbl.	1.75 –	.....
Cabell	bbl.	1.70 –	.....
Somerset	bbl.	1.80 –	.....
Illinois	bbl.	1.37 –	.....
Indiana	bbl.	1.38 –	.....
Kansas and Okla. under 28 deg.	bbl.	.75 –	.85
California, 35 deg. and up	bbl.	.40 –	..

Gasoline, Etc.

Motor gasoline steel bbls.	gal.	$0.17 –	.....
Naphtha, V. M. & P. deod, steel bbls.	gal.	.16½ –	.....
Kerosene, ref. tank wagon	gal.	.13 –	.....
Bulk, W.W. delivered, N.Y.	gal.	.08½ –	.....
Lubricating oils:			
Cylinder, Penn., filtered	gal.	.34 –	$0.35
Bloomless, 30@ 31 grav.	gal.	.24 –	.....
Paraffin, pale 885 vis	gal.	.16½ –	.17
Spindle, 200, pale	gal.	.25 –	.26
Petrolatum, amber, bbls.	lb.	.04 –	.04½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–$145
Chrome brick, f.o.b. Eastern shipping points	ton	45–47
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	43–46
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	36–40
Magnesite brick, 9-in. straight (f.o.b. wks)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48–50
9-in. sizes, f.o.b., Birmingham	1,000	45–47
F.o.b. Mt. Union, Pa.	1,000	40–42
Silicon carbide refract brick, 9-in.	1,000	1,180.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, ton		$200.00 –	.....
Ferrochromium, per lb. of Cr, 1-2% C.	lb.	.30 –	.....
4-6% C.	lb.	.10½ –	.11
Ferromanganese, 78-82% Mn. Atlantic seabd. duty paid	gr. ton	115.00 –	.....
Spiegeleisen, 19-21% Mn.	gr. ton	32.00 –	33.00
Ferromolybdenum, 50-60% Mo, per lb. Mo.	lb.	1.80 –	2.00
Ferrosilicon, 10-12%	gr. ton	39.50 –	43.50
50%	gr. ton	72.00 –	75.00
Ferrotungsten, 70-80% per lb. of W.	lb.	.85 –	.90
Ferro-uranium, 35-50%, of U, per lb. of U.	lb.	4.50 –	.....
Ferrovanadium, 30-40%, per lb. of V.	lb.	3.25 –	4.00

Ores and Mineral Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$5.50 –	$8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 –	.....
C.i.f. Atlantic seaboard	ton	18 50 –	24 00
Coke, fdry., f.o.b. ovens	ton	5.00 –	5.50
Coke, furnace, f.o.b. ovens	ton	4.00 –	4.25
Fluorspar, gravel, f.o.b. mines, Illinois	ton	17.50 –	18.50
Ilmenite, 52% TiO_2 Va.	lb.	.01½ –	.....
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.39 –	.41
Manganese ore, chemical (MnO_2)	ton	75.00 –	80 00
Molybdenite 85% MoS_2, per lb. Mo S_2, N. Y.	lb.	.65 –	.75
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	06 –	.08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½ –	.12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.12 –	.....
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 –	.....
Rutile, 94@96% TiO_2	lb.	.12 –	.15
Tungsten ore, scheelite, 60% WO_3 and over	unit	9.50 –	9.75
Tungsten, wolframite, white, 60% WO_3	unit	9.00 –	9.10
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 –	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	12.25 –	12.50
Vanadium pentoxide, 76%	lb.	3.00 –	3.25
Vanadium ore, per lb. V_2O_5	lb.	1.00 –	1.25
Zircon, 99%	lb.	.06 –	.07

Non-Ferrous Metals

Copper, electrolytic	lb.	$0.14¼ –	$0.15¼
Aluminum, 98 to 99%	lb.	.27 –	.28
Antimony, wholesale, Chinese and Japanese	lb.	.17½ –	.....
Nickel, 99%	lb.	.31 –	.32
Monel metal	lb.	.32	
Tin, 5-ton lots, Straits	lb.	.58¾	
Lead, New York, spot	lb.	.10¼	
Zinc, spot, New York	lb.	.0825	
Silver (commercial)	oz.	.68¾	
Cadmium	lb.	.60– 62	
Bismuth (508 lb. lots.)	lb	1.25–1 30	
Cobalt	lb.	2.50–3 00	
Magnesium, ingots, 99%	lb.	.90–95	
Platinum, refined	oz.	117 00	
Mercury 75	lb.	81 00–83.00	
Tungsten powder	lb.	.95–1.00	

Comparative Prices in the New York Market, 1924

The following prices refer to round lots in the New York market. Where it is the trade custom to sell f.o.b. producing points, the quotations are given on that basis and are so designated. The figures show the opening price, the high, the low and the closing price for 1924.

Industrial Chemicals

			Jan. 1	High	Low	Dec. 31
Acetone, drums		lb.	$0.25	$0.25	$0.12	$0.12
Acid, acetic, 28%, bbl.	100	lb.	3.38	3.38	3.12	3.12
Boric, bbl.		lb.	.10	.10	.09	.09
Citric, dom., kegs		lb.	.48	.49	.46½	.46½
Citric, imp., kegs		lb.	.46	.47	.45	.45½
Lactic, 44%, tech., light, bbl.		lb.	.11½	.13½	.11	.13½
22% tech., light, bbl		lb.	.05½	.06½	.05½	.06½
Muriatic, 18° tanks	100	lb.	.90	.90	.80	.80
Nitric, 36° carboys	100	lb.	4.50	4.50	4.00	4.00
Oxalic, crystals, bbl.		lb.	.12	.12	.09	.10½
Sulphuric, 60°, tanks		ton	9.00	9.00	7.50	8.00
Tartaric, imp., powd., bbl		lb.	.26½	.28	.25	.26
Tartaric, domestic, bbl		lb.	.30	.31	.28	.29
Alcohol Ethyl, 190 p'f. U.S.P., bbl.		gal.	4.80	4.89	4.73	4.89
Alcohol, denatured, 190 proof						
No. 1 special dr.		gal.	.51½	.55	.43	.55
No. 5, 188 proof, dr.		gal.	.50½	.54	.42	.54
Alum, ammonia, lump, bbl.		lb.	.03½	.03½	.03½	.03½
Potash, lump, bbl.		lb.	.02½	.03	.02½	.02½
Aluminum sulphate, com., bags	100	lb.	1.40	1.40	1.30	1.35
Aqua ammonia, 26°, drums		lb.	.07	.07	.06½	.06½
Ammonia, anhydrous, cyl.		lb.	.30	.30	.28	.28
Ammonium carbonate, powd. tech., casks		lb.	.09	.12½	.09	.12½
Ammonium nitrate, tech., casks		lb.	.08½	.09	.08½	.09
Ammonium sulphate, wks	100	lb.	2.75	2.85	2.65	2.75
Amylacetate tech., drums		gal.	4.50	4.50	3.00	3.75
Arsenic, white, powd., bbl.		lb.	.13	.13	.05½	.06½
Arsenic, red, powd., kegs		lb.	.15	.15½	.14½	.14½
Barium carbonate, bbl.		ton	68.00	68.00	52.00	54.00
Barium chloride, bbl.		ton	80.00	80.00	63.00	64.00
Barium, nitrate, casks		lb.	.08	.08½	.07	.07½
Bleaching powder, f.o.b. wks., drums	100	lb.	1.25	1.90	1.25	1.90
Borax, bbl.		lb.	.05½	.05½	.05	.05
Calcium acetate, bags	100	lb.	4.00	4.00	3.00	3.00
Calcium arsenate, dr.		lb.	.12½	.12½	.08	.08
Calcium carbide drums		lb.	.05	.05	.05	.05
Calcium chloride, fused, dr. wks.		ton	21.00	21.00	21.00	21.00
Carbon bisulphide, drums		lb.	.06½	.06½	.06	.06
Carbon tetrachloride drums		lb.	.09	.09½	.06½	.06½
Chlorine, liquid, tanks, wks.		lb.	.03	.04	.03	.04
Cobalt, oxide bbl.		lb.	2.10	2.10	2.10	2.10
Copperas, bulk, f.o.b. wks.		ton	25.00	25.00	15.00	15.00
Copper carbonate, bbl.		lb.	.16½	.17	.15½	.16½
Copper sulphate, dom., bbl.	100	lb.	.04½	.05	.04½	.04½
Imp. bbl.	100	lb.	.04½	.04½	.04½	.04½
Cream of tartar, bbl.		lb.	.22½	.22½	.20½	.20½
Epsom salt, dom., tech., bbl.	100	lb.	1.90	1.90	1.75	1.75
Epsom salt, imp., tech., bags	100	lb.	1.00	1.40	.95	1.35
Ethyl acetate, 85% drums		gal.	.97	1.00	.92	.92
Formaldehyde, 40%, bbl		lb.	.10½	.10½	.08½	.09
Fusel oil, crude, drums		gal.	4.00	4.00	2.80	3.10
Glaubers salt, bags	100	lb.	.90	.95	.85	.90
Glycerine, c.p., drums, extra		lb.	.16½	.19½	.16½	.19
Lead:						
White, basic carbonate, dry, casks		lb.	.09½	.10½	.09	.11
White, basic sulphate, casks		lb.	.08½	.10	.08½	.10½
Lead acetate, white crys., bbl.		lb.	.14	.15½	.14	.15½
Lead arsenate, powd., bbl.		lb.	.18	.18	.16	.16
Lithopone, bags		lb.	.06½	.06½	.05½	.06
Magnesium carb., tech., bags		lb.	.08	.08	.07	.07
Methanol, 95%, dr.		gal.	.88	.88	.70	.70
Methanol, 97%, dr		gal.	.90	.90	.72	.72
Nickel salt, double, bbl.		lb.	.10	.10½	.09½	.10
Nickel salts, single, bbl.		lb.	.11	.11½	.10½	.10½
Phosphorus, red, cases		lb.	.70	.75	.70	.70
Phosphorus, yellow, cases		lb.	.35	.37½	.35	.37½
Potassium bichromate, casks		lb.	.09½	.09½	.08½	.08½
Potassium carbonate, 80-85%, calcined, casks		lb.	.05½	.06½	.05½	.06
Potassium chlorate, powd.		lb.	.07½	.07½	.06½	.06½
Potassium hydroxide (caustic potash) drums		lb.	.06½	.07½	.06½	.07½
Potassium muriate, 80% bags		ton	34.55	34.55	34.55	34.55
Potassium nitrate, bbl.		lb.	.06½	.07	.06	.06
Potassium permanganate, drums		lb.	.14	.15	.12½	.14½
Potassium prussiate, red, casks		lb.	.44	.44	.35	.36½
Potassium prussiate, yellow, casks		lb.	.22	.22	.16	.16½
Salammoniac, white, imp., casks		lb.	.06½	.06½	.05½	.05½
Salsoda, bbl.	100	lb.	1.10	1.20	1.10	1.20
Soda ash, light, 58% bags, contract	100	lb.	1.25	1.25	1.25	1.25
Soda, caustic, 76%, solid, drums contract	100	lb.	3.10	3.10	3.10	3.10
Sodium acetate, works, bbl.		lb.	.05	.05	.04½	.05
Sodium bicarbonate, 330-lb. bbl.	100	lb.	1.75	1.75	1.75	1.75
Sodium bichromate, casks		lb.	.07½	.07½	.06	.06½
Sodium chlorate, kegs		lb.	.06½	.06½	.06½	.06½
Sodium cyanide, cases, dom.		lb.	.22	.22	.22	.22
Sodium cyanide, imp. cases		lb.	.19	.21	.18½	.19
Sodium fluoride, bbl.		lb.	.08½	.09½	.08½	.08½
Sodium nitrate, bags	100	lb.	2.50	2.55	2.37½	2.47½
Sodium nitrite, casks		lb.	.08	.08	.09½	.09
Sodium phosphate, dibasic, bbl.		lb.	.03½	.03½	.03½	.03½
Sodium prussiate, yel. drums		lb.	.11½	.11½	.09	.09½
Sodium silicate (40°, drums)	100	lb.	.75	.75	.75	.75
Sodium sulphide, fused, 60-62% drums	100	lb.	3.00	3.00	2.75	2.75
Sodium sulphite, crys., bbl.		lb.	$0.03¼	$0.03½	$0.03	$0.03½
Strontium nitrate, powd., bbl.		lb.	.11	.11	.08¾	.09½
Sulphur, crude at mine, bulk		ton	16.00	16.00	16.00	16.00
Sulphur, flour, bag	100	lb.	2.35	2.35	2.25	2.25
Tin bichloride, bbl.		lb.	.12½	.15½	.12½	.15½
Tin oxide, bbl.		lb.	.51	.58	.48	.58
Tin crystals, bbl.		lb.	.34½	.38½	.34½	.38½
Zinc chloride, gran., bbl.		lb.	.06½	.06½	.06	.06
Zinc oxide, lead free, bag		lb.	.07½	.07½	.07½	.07½
5% lead sulphate, bags		lb.	.07	.07	.06½	.06½
Zinc sulphate, bbl.	100	lb.	3.00	3.25	2.75	3.25

Coal-Tar Products

			Jan. 1	High	Low	Dec. 31
Alpha-naphthol, crude, bbl.		lb.	$0.60	$0.62	$0.60	$0.60
Alpha-naphthol, ref., bbl		lb.	.70	.75	.68	.75
Alpha-naphthylamine, bbl.		lb.	.35	.35	.35	.35
Aniline oil, drums, extra		lb.	.16	.16	.16	.16
Aniline salts, bbl.		lb.	.22	.23	.19	.22
Anthracene, 80%, drums		lb.	.75	.75	.65	.70
Anthracquinone, 25%, drums		lb.	.75	.75	.65	.65
Benzaldehyde, tech., carboys		lb.	.75	.75	.68	.70
Benzene, 90%, tanks, works		gal.	.21	.23	.21	.23
Benzidine base, bbl.		lb.	.82	.82	.76	.78
Benzoic acid, U.S.P., kegs		lb.	.85	.85	.70	.70
Benzoate of soda, U. S. P., bbl.		lb.	.65	.68	.62	.62
Benzyl chloride, tech., drums		lb.	.25	.25	.25	.25
Beta-naphthol, tech., bbl.		lb.	.24	.26	.22	.24
Beta-naphthylamine, tech		lb.	.72	.75	.65	.65
Creosol, U.S.P., drums		lb.	.25	.25	.22	.22
Cresylic acid, 97%, works drums		gal.	.75	.75	.59	.59
95-97%, drums, works		gal.	.70	.70	.55	.55
Dichlorbenzene, drums		lb.	.06	.07	.06	.06
Diethylaniline, drums		lb.	.50	.58	.49	.58
Dimethylaniline, drums		lb.	.38	.38	.35	.36
Dinitrophenol, bbl.		lb.	.35	.35	.32	.32
Dinitrotoluen, bbl.		lb.	.20	.21	.18	.19
Diphenylamine, bbl.		lb.	.50	.50	.48	.48
H-acid, bbl.		lb.	.75	.75	.68	.70
Monochlorbenzene, drums		lb.	.08	.08½	.08	.08
Monoethylaniline, drums		lb.	.95	.95	.90	.90
Naphthalene, flake, bbl.		lb.	.06	.06	.04½	.05½
Naphthalene, balls, bbl.		lb.	.06½	.07	.05	.06½
Naphthionate of soda, bbl.		lb.	.60	.60	.58	.58
Naphthionic acid, crude, bbl.		lb.	.55	.62	.55	.62
Nitrobenzene, drums		lb.	.09½	.09½	.09	.09
N-W acid, bbl.		lb.	1.10	1.15	1.05	1.10
Ortho-amidophenol, kegs		lb.	2.30	2.40	2.30	2.40
Ortho-dichlorbenzene, drums		lb.	.10	.10	.08	.10
Ortho-nitrophenol, bbl.		lb.	1.20	1.20	1.00	1.00
Ortho-nitrotoluene, drums		lb.	.10	.10	.09	.09
Ortho-toluidine, bbl.		lb.	.14	.18	.14	.17
Para-aminophenol, base, kegs		lb.	1.30	1.30	1.15	1.15
Para-dichlorbenzene, bbl.		lb.	.17	.17	.17	.17
Para-nitroaniline, bbl.		lb.	.70	.72	.65	.65
Para-nitrotoluene, bbl.		lb.	.55	.55	.40	.40
Para-phenylenediamine, bbl.		lb.	1.40	1.40	1.25	1.30
Para-toluidine, bbl.		lb.	.85	.85	.75	.75
Phthalic anhydride, bbl.		lb.	.30	.30	.25	.25
Phenol, U.S.P., dr.		lb.	.26	.26	.23	.23
Picric acid, bbl.		lb.	.20	.20	.20	.20
Resorcinol, tech., kegs		lb.	1.40	1.50	1.30	1.30
R-salt, bbl.		lb.	.55	.55	.48	.50
Salicylic acid, tech., bbl.		lb.	.32	.34	.32	.32
Salicylic acid, U.S.P., bbl.		lb.	.35	.36	.35	.35
Solvent naphtha, crude, tanks		gal.	.20	.21	.18	.21
Sulphanilic acid, crude, bbl.		lb.	.18	.18	.16	.16
Toluidine, mixed, kegs		lb.	.30	.32	.30	.30
Toluene, tank cars, works		gal.	.24	.26	.24	.26
Xylidine drums		lb.	.50	.50	.40	.40
Xylene, 5%, drums		gal.	.45	.45	.38	.38
Xylene, com., tanks		gal.	.28	.28	.24	.25

Oils and Fats

			Jan. 1	High	Low	Dec. 31
Castor oil, No. 3, bbl.		lb.	.14	.17	.14	.17
Chinawood oil, bbl.		lb.	.21	.21	.12	.15½
Cocoanut oil, Ceylon, tanks, N. Y.		lb.	.08½	.10½	.08½	.10½
Corn oil, Crude, tanks, (f.o.b. mill)		lb.	.09½	.10½	.08½	.10½
Cottonseed oil, crude (f.o.b. mill), tanks		lb.	.09½	.11¼	.08	.09½
Linseed oil, raw, car lots, bbl.		gal.	.90	1.15	.88	1.15
Palm, Lagos, casks		lb.	.07½	.09½	.07½	.09½
Niger, casks		lb.	.06½	.08½	.06½	.08½
Peanut oil, crude, tanks (mill)		lb.	.12	.13½	.11½	.11½
Rapeseed oil, refined, bbl.		gal.	.76	.98	.76	.97
Sesame, bbl.		lb.	.12½	.14½	.11½	.14½
Soya bean tank (f.o.b. N. Y.)		lb.	.10½	.12½	.10½	.11½
Sulphur (olive foots), bbl.		lb.	.09	.09½	.08½	.09½
Cod, Newfoundland, bbl.		gal.	.68	.68	.58	.62
Menhaden, light pressed, bbl.		gal.	.65	.70	.60	.70
Crude, tanks (f.o.b. factory)		gal.	.47	.55	.38	.55
Grease, yellow, loose		lb.	.06½	.09	.06½	.09½
Oleo Stearine		lb.	.10	.13	.10	.12
Red oil, distilled, d.p. bbl.		lb.	.08½	.11½	.08½	.11½
Tallow, extra, loose		lb.	.08	.11	.07½	.11

Miscellaneous

			Jan. 1	High	Low	Dec. 31
Paraffine wax, crude, 124 m.p. bg.		lb.	$0.03½	$0.06½	$0.03½	$0.05½
Rosin, B-D, bbl.	280	lb.	5.60	7.65	5.60	7.65
Turpentine, sprits, bbl.		gal.	.92½	1.03	.81	.84